HNE
AKRON

Traction Machine

Model ATP7

Service Manual

&

Parts List

HNE
AKRON

Electrical Safety Supplement

➲ *Please pay close attention to this supplement for your safety.*

If the plug is to be replaced the following instructions MUST be adheared to:

- The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured Black.
- The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.
- The correct value fuse of 5 AMPS and ASTA approved to BS1362 must be used.

➲ ***WARNING: NEITHER THE BLUE OR BROWN WIRE IS TO BE CONNECTED TO THE EARTH TERMINAL OF A THREE PIN PLUG.***

ISSUE 1 : OCT 95

JAN BARRETT

AKRON Micro-Traction Unit ("ATP7") - Alignment procedure.

IMPORTANT NOTE:

BEFORE attempting to perform any of the operations described in this document, it is VITALLY IMPORTANT to read each paragraph through COMPLETELY. Several operations, particularly in Section 6, require specific action to be taken in a limited period of time and it is NOT ACCEPTABLE to stop and read the remainder of a paragraph during the operation to be performed.

NOTE: On boards where test points are not fitted, connection should be made to the components given in brackets.

1. Power Supply Sub-assembly - Inspection.

1.1 Check that both mains fuses are in place and of the correct value. Check that the cable from the PSU sub-assembly is NOT connected to anything.

1.2 Check that the wiring of the primary windings on the transformer is appropriate to the mains supply being used.

1.3 Check that the earth connection from the mains inlet connector is bolted SECURELY to the metalwork of the sub-assembly at the central earthing bolt. If the sub-assembly is fitted in the unit, check that all earthing leads from the rest of the unit are also bolted SECURELY to the sub-assembly at the central earthing bolt.

2. K3790 Power Board.

All voltages are measured with respect to OV at TP1 (CON1 pin 1).

2.1 Ensure that the mains is switched off. Connect the PSU sub-assembly cable to CON2. Ensure that ALL other cables to/from the power board are DISCONNECTED.

2.2 Switch on and monitor the following supply rails with a DVM set to its DC voltage range:

(i) TP2 (CON1 pins 3 and 4) +5V ±2%;
(ii) TP3 (CON1 pin 6) +12V ±5%;
(iii) TP4 (CON1 pin 7) -12V ±5%;

2.3 Switch off the power.

2.4 Connect all remaining cables between the boards in the system.

3. Strain-gauge System - Zero-point Adjustment.

Before the following operations are carried out, the unit should be left switched-on for preferably one hour with the cover in place to allow the strain-gauge temperature to stabilize.

NOTE: UNLESS OTHERWISE STATED, all references to components, test points, etc., are on the K3820 amplifier board. All voltages are measured with respect to TP1 (GND) on the K3820 amplifier board. On any boards where test points are not fitted or on K3820 amplifier boards where ALL 5 test points are not fitted, connection should be made to the components given in brackets.

3.1 Ensure that the power is disconnected. Disconnect the motor from the K3790 power board at CON3 (2-way 0.156" AMP).

3.2 Ensure that ALL other cables are connected correctly between all boards and sub-assemblies within the system. IN PARTICULAR, check that each cable connector correctly engages with ALL of the pins on its respective board connector and that the socket has not been displaced to the left or right.

3.3 On the K3780 CPU board, bridge the diagnostic link LK1 and bridge TP1 to TP2 and TP3 to TP4 (or short out D5 and D7) using miniature test clips. This will prevent the safety system reacting in case of gross mis-alignment. For safety reasons, there is no other way of inhibiting the operation of the safety system.

3.4 Press and hold the START/CANCEL button with the power switched off. Whilst holding the button down, switch on the power and check that every LED element on the front panel lights for approximately 0.5 seconds. Release the button after the alarm has briefly sounded. This operation sets the system in its calibration mode and also sets the drift-correction system in the centre of its range, which allows accurate setting-up of the amplifier.

3.5 Set the DVM to its DC Volts range. Check that +12V and -12V are present on pins 4 and 5 respectively of CON4 on the K3820 amplifier board.

3.6 Set VRs 2,3,4 and 5 to mid-travel (20 full turns anticlockwise, followed by 10 full turns clockwise) and VRs 1 and 6 FULLY anticlockwise (20 full turns).

3.7 Set the DVM to its DC voltage range and connect it to TP2 (or IC1 pin 1). Check that the rope is COMPLETELY slack. Adjust VR3 (channel 1 null) to give a reading of 0V ±1mV.

3.8 Connect the DVM to TP4 (or IC2 pin 14). Note the reading, which should be within ±10mV of 0V. Pull on the rope and check that the voltage increases. If the voltage decreases, check that the strain-gauge bridge is installed in the chassis correctly and that the wires from the bridge are connected to the amplifier correctly. Release the rope and check that the reading returns to the originally noted value.

3.9 Set the DVM to its DC voltage range and connect it to TP3 (or IC1 pin 7). Check that the rope is still COMPLETELY slack. Adjust VR4 (channel 2 null) to give a reading of 0V ±1mV.

3.10 Connect the DVM to TP5 (or IC2 pin 8). Note the reading, which should be within ±10mV of 0V. Pull on the rope and check that the voltage increases. If the voltage decreases, check that the strain-gauge bridge is installed in the chassis correctly and that the wires from the bridge are connected to the amplifier correctly. Release the rope and check that the reading returns to the originally noted value.

3.11 Switch off the power. Remove the shorting links from TP1, TP2, TP3 and TP4 (or D5 and D7) on the K3780 CPU board. Press and hold the START/CANCEL button with the power switched off. Whilst holding the button down, switch on the power to set the unit in its calibration mode again. Continue holding the button and check that the timer display shows either 'G1' or 'G2', which indicates that either strain-gauge channel 1 or channel 2 is being read. Repeatedly pressing this button will cause the display to alternate between 'G1' and 'G2' when the button is held. Press the button and note the channel being read. If 'G2' is displayed, release and press again so that 'G1' is displayed. Release the button.

3.12 Turn VR1 (channel 1 offset) clockwise and note that the timer display should gradually count up from '-9' to '00'. Set VR1 at the point where the display shows '00' and the right-hand decimal point just flickers on and off.

3.13 Connect the DVM to TP4 (or IC2 pin 14) and note the reading. Turn VR1 anticlockwise slightly to reduce the reading by 10mV. Check that the right-hand decimal point is off and '00' is still displayed.

3.14 Press and hold the START/CANCEL button. Check that 'G2' is displayed, which confirms that the display is now monitoring channel 2. Release the button.

3.15 Turn VR5 (channel 2 offset) clockwise and note that the timer display should gradually count up from '-9' to '00'. Set VR6 at the point where the display shows '00' and the right-hand decimal point just flickers on and off.

3.16 Connect the DVM to TP5 (or IC2 pin 8) and note the reading. Turn VR6 anticlockwise slightly to reduce the reading by 10mV. Check that the right-hand decimal point is off and '00' is still displayed.

3.17 Turn off the power. Re-connect the motor to the power board.

NOTE: The zero-points of the strain-gauge amplifiers have now been established. The calibration procedure will be completed in the following section when the unit is fully operational.

4. Strain-gauge System - Calibration (0-100kg units).

NOTE: If the unit is to be calibrated for 0-200lb operation, ignore the whole of this section and continue at section 5.

4.1 Turn off the power. Set the system in its calibration mode by first ensuring that the diagnostic link is bridged. Press and hold the START/CANCEL button with the power turned off. Whilst holding the button down, switch on the mains and check that every LED element on the front panel lights for approximately 0.5 seconds. Release the button after the alarm has briefly sounded. This operation will set the drift-correction system in the centre of its range, which allows accurate setting-up of the amplifier.

4.2 Set the SET HIGH FORCE control fully clockwise. Rotate the SET LOW FORCE control through its complete range and check that the flashing low-force indicator on the bargraph moves over the whole length of the display with no multiple or missing segments. Leave the control fully anticlockwise and check that the flashing indicator disappears.

4.3 Rotate the SET HIGH FORCE control through its complete range and check that the flashing high-force indicator on the bargraph moves over the whole length of the display as in 4.2. Set the control fully anticlockwise and check that the flashing indicator remains at the extreme left-hand segment.

4.4 Press the START/CANCEL button to select 'G1' for monitoring. Adjust the SET HIGH FORCE control to set the high-force indicator to 10kg. Connect the rope to a fixed point by means of a suitable tension-measuring gauge and take up the slack in the rope using the ROPE RELEASE. Press and hold the SET TIME 'up' button and check that the motor begins to run in such a way as to cause the rope to tighten. Check that the force indicated on the bargraph and the numerical value

indicated on the timer display both increase as the tension in the rope increases, although, at this stage, the two values probably will not agree. Check that the motor stops when the indicated force reaches the high-force indicator at 10kg. Release the SET TIME 'up' button.

4.5 Select 'G2' for monitoring, using the START/CANCEL button. Check that the display also indicates a positive force. The reading is unlikely to match that shown for 'G1' or the bargraph reading as yet.

4.6 Press and hold the SET TIME 'down' button and check that the motor runs in the opposite direction and the rope becomes slack again.

4.7 Make absolutely sure that the rope is COMPLETELY slack. Alternately select 'G1' and 'G2' on the display using the START/CANCEL button and check that the display still shows 00 with the right-hand decimal point unlit when the START/CANCEL button is released.

NOTE: The tension-measuring part of the unit is about to be calibrated. This will be done by setting up a known tension in the rope and adjusting the calibration controls within the unit to indicate that tension. The motor remains unpowered during this time and thus the rope tends to slacken off gradually, so that the tension is no longer that originally set. Obviously, this effect will cause the calibration adjustments to be in error if the rope slackens off significantly. The following adjustments must therefore be carried out in the shortest possible time and the rope tension must be checked constantly whilst doing so. It may help to read the following directions through once or twice to become acquainted with them before attempting to calibrate the unit.

4.8 Adjust the SET HIGH FORCE control to set the high-force indicator to about 60kg. Select 'G1' again and apply exactly 50kg of tension as measured by the measuring device (NOT the bargraph or timer display) to the rope using the SET TIME 'up' button. To ensure accurate calibration, it is essential that the rope runs in the centre of the white pulley and winds onto the centre of the drum as the tension increases.

NOTE: If the required tension is exceeded, the tension MUST be reduced to 30kg using the SET TIME 'down' button before using the 'up' button to wind up to the required tension again. This is VITAL as otherwise the effects of hysteresis in the rope will ruin the calibration.

4.9 Adjust VR2 (channel 1 gain) on the K3820 amplifier board to give a reading that just flickers between '49' and '50'.

4.10 Select 'G2' on the display and repeat 4.8 and 4.9, but this time adjusting VR5 (channel 2 gain). Remember that the rope is slackening slightly all the time, which will affect accuracy if not corrected.

4.11 Slacken the rope completely by means of the SET TIME 'down' button and then use the 'up' button to set a tension of 3kg with the right-hand decimal point off. Locate VR1 on the K3780 CPU board. Observe the left-hand decimal point, which indicates the status of the zero-tension detector. If the decimal point is on, turn VR1 anticlockwise to turn it off. If the point is off, turn VR1 clockwise to turn it on. Set VR1 to the point where the decimal point just flickers on and off. Slacken the rope completely and check that the left-hand decimal point is on. Increase the tension by pulling gently on the rope and check that the left-hand decimal point goes off at about 2-3kg.

4.12 Set a tension of 10kg on the rope, using the SET TIME buttons. Switch off the power and remove the diagnostic link. Switch on and check that the motor unwinds the tension to 0kg. The motor should then run backwards and forwards to find the zero-tension point and finally run for a few seconds more to leave the rope slack before stopping.

NOTE: Now ignore section 5 (0-200lb calibration) and continue with section 6.

5. Strain-gauge System - Calibration (0-200lb units).

5.1 Turn off the power. Set the system in its calibration mode by first ensuring that the diagnostic link is bridged. Press and hold the START/CANCEL button with the power turned off. Whilst holding the button down, switch on the mains and check that every LED element on the front panel lights for approximately 0.5 seconds. Release the button after the alarm has briefly sounded. This operation will set the drift-correction system in the centre of its range, which allows accurate setting-up of the amplifier.

5.2 Set the SET HIGH FORCE control fully clockwise. Rotate the SET LOW FORCE control through its complete range and check that the flashing low-force indicator on the bargraph moves over the whole length of the display with no multiple or missing segments. Leave the control fully anticlockwise and check that the flashing indicator disappears.

5.3 Rotate the SET HIGH FORCE control through its complete range and check that the flashing high-force indicator on the bargraph moves over the whole length of the display as in 5.2. Set the control fully anticlockwise and check that the flashing indicator remains at the extreme left-hand segment.

5.4 Press the START/CANCEL button to select 'G1' for monitoring. Adjust the SET HIGH FORCE control to set the high-force indicator to 20lb. Connect the rope to a fixed point by means of a suitable tension-measuring gauge and take up the slack in the rope using the ROPE RELEASE. Press and hold the SET TIME 'up' button and check that the motor begins to run in such a way as to cause the rope to tighten. Check that the force indicated on the bargraph and the numerical value indicated on the timer display both increase as the tension in the rope increases. The timer display value should be in the order of 50% of the bargraph indication. Check that the motor stops when the indicated force reaches the high-force indicator at 20lb. Release the SET TIME 'up' button.

5.5 Select 'G2' for monitoring, using the START/CANCEL button. Check that the display also indicates a positive force. The reading is unlikely to match that shown for 'G1' as yet.

5.6 Press and hold the SET TIME 'down' button and check that the motor runs in the opposite direction and the rope becomes slack again.

5.7 Make absolutely sure that the rope is COMPLETELY slack. Alternately select 'G1' and 'G2' on the display using the START/CANCEL button and check that the display still shows 00 with the right-hand decimal point unlit when the START/CANCEL button is released.

NOTE: The tension-measuring part of the unit is about to be calibrated. This will be done by setting up a known tension in the rope and adjusting the calibration controls within the unit to indicate that tension. The motor remains unpowered during this time and thus the rope tends to slacken off gradually, so that the tension is no longer that originally set. Obviously, this effect will cause the calibration adjustments to be in error if the rope slackens off significantly. The following adjustments must therefore be carried out in the shortest possible time and the rope tension must be checked constantly whilst doing so. It may help to read the following directions through once or twice to become acquainted with them before attempting to calibrate the unit.

5.8 Adjust the SET HIGH FORCE control to set the high-force indicator to about 120lb. Select 'G1' again and apply exactly 100lb of tension as measured by the measuring device (NOT the bargraph or timer display) to the rope using the SET TIME 'up' button. To ensure accurate calibration, it is essential that the rope runs in the centre of the white pulley and winds onto the centre of the drum as the tension increases.

NOTE: If the required tension is exceeded the tension MUST be reduced to 30kg using the SET TIME 'down' button before using the 'up' button to wind up to the required tension again. This is VITAL as otherwise the effects of hysteresis in the rope will ruin the calibration.

5.9 Adjust VR2 (channel 1 gain) on the strain-gauge amplifier board to give an indication on the timer display that just flickers between '49' and '50'.

5.10 Select 'G2' on the display and repeat 5.8 and 5.9, but this time adjusting VR5 (channel 2 gain). Remember that the rope is slackening slightly all the time, which will affect accuracy if not corrected.

5.11 Slacken the rope completely by means of the SET TIME 'down' button and then use the 'up' button to give an indication of 03 on the timer display with the right-hand decimal point off. Locate VR1 on the K3780 CPU board. Observe the left-hand decimal point, which indicates the status of the zero-tension detector. If the decimal point is on, turn VR1 anticlockwise to turn it off. If the point is off, turn VR1 clockwise to turn it on. Set VR1 to the point where the decimal point just flickers on and off. Slacken the rope completely and check that the left-hand decimal point is on. Increase the tension by pulling gently on the rope and check that the left-hand decimal point goes off when the bargraph indicates about 4-6lb.

5.12 Set a tension of 20lb on the rope, using the SET TIME buttons. Switch off the power and remove the diagnostic link. Switch on and check that the motor unwinds the tension to 0lb. The motor should then run backwards and forwards to find the zero-tension point and finally run for a few seconds more to leave the rope slack before stopping.

6. System Operation Check.

6.1 Set the controls as follows:

High Force:		50kg (0-100kg models);
	or	100lb (0-200lb models);
Low Force:		10kg (0-100kg models);
	or	20lb (0-200lb models);
Programme:		3;
Treatment Time:		2 minutes;
Hold Time:		10 seconds;
Rest Time:		4 seconds;

Start the treatment programme by pressing the START/CANCEL button. Note that a safety feature requires this button to be held continuously for 0.5 seconds in order to start a

programme. Check that the tension cycles between the set values with rest and hold times as selected. Check with a stop-watch that the treatment time displayed counts down accurately from 2 to 0. Check that, when the time reaches 00, the current treatment cycle is completed and then the rope is slackened completely. When the alarm sounds, check that the START/CANCEL button cancels it.

6.2 Repeat the treatment programme in 6.1. Whilst it is running, adjust the rear-panel speed limit control (if fitted) and check that the motor speed can be varied. If the rear-panel control is not fitted, adjust VR3 (pre-set speed limit) on the power board for a suitable motor speed. Note that VR3 has no effect if the rear-panel control is connected. Check that the programme can be terminated early by pressing the START/CANCEL button.

6.3 Repeat the treatment programme in 6.1. When the programme is under way, test the operation of the PATIENT-INTERRUPT control. Check that the timer displays 'P.I.' with the alarm sounding and that the alarm can be silenced by pressing the START/CANCEL button. Check that the rope unwinds fully at a controlled rate. Check that the machine cannot now be re-started without first being reset by turning the power off and then on.

WARNING! Read ALL of the following paragraph, including the note, BEFORE attempting the procedure,

NOTE: In paragraph 6.4, directions are given to disconnect the motor and then to re-connect it when the alarm sounds a rapid intermittent warning. The motor MUST be re-connected IMMEDIATELY when the rapid alarm sounds to prevent the safety system from removing the motor power. This procedure tests the safety circuitry and the zero-tension detector, both of which function independently of the CPU. If the safety system inadvertently operates and removes the motor power, the unit MUST be switched off and on again to reset it before repeating the test.

6.4 Switch off the power. Remove the motor fuse F2 on the power board and wire a 3.3-ohm resistor (capable of dissipating 50W) across the fuseholder. Note that this resistor will limit the motor current and cause the motor to stall before the rope tension reaches the set high-force, probably resulting in a 'F70' or 'F71' fault indication. Such a fault indication should be ignored. Switch on the power. Repeat the treatment programme in 6.1 but when the motor stalls, disconnect the motor from the power board at CON3 (2-way 0.156" AMP) and activate the PATIENT INTERRUPT. Cancel the alarm by pressing the START/CANCEL button and, when the alarm sounds a rapid intermittent signal, QUICKLY re-connect the motor and check that the rope slackens. Check that the

motor stops when the rope becomes slack. Check that the machine cannot be re-started without first being reset by turning the power off and then on.

6.5 Connect a DVM (set to read DC volts) across D9 on the power board to monitor the motor supply. Repeat 6.4, but DO NOT re-connect the motor when the alarm sounds its rapid intermittent tone. Check that, after a further short delay, the voltage on the DVM falls to below 2V. Turn off the mains supply QUICKLY to avoid over-heating the resistor or the thyristor Q6. Remove the resistor and replace the fuse, ensuring that it has the correct rating. Re-connect the motor to the power board. This procedure has tested the ability of the safety system to disconnect power from the motor, should the rope tension not be released following a Patient-interrupt. (This action would normally blow the fuse, were it fitted.)

6.6 Ensure that ALL fuses and cables have been replaced correctly. Repeat 6.1 to ensure that the unit still functions correctly under normal conditions.

This concludes the setting-up and testing procedure for the ATP7.

Appendix A - Fault Codes.

The unit has a built-in fault-reporting system that provides an indication of any abnormal conditions detected. The indication takes the form of a flashing 'F' alternating with a flashing number, displayed in place of the treatment time. The numbers that could be displayed are listed below, together with checks that can be made to identify associated problems.

The sounding alarm accompanying a fault indication can be cancelled by a single press of the START/CANCEL button. The fault indication itself is cancelled by a further press, but only if the fault condition has cleared and does not require a power-up reset (as noted in the descriptions below). Note that the reporting of faults is inhibited while the diagnostic link is bridged.

PI - PATIENT-INTERRUPT control activated.

Although not a fault as such, this indication is provided when the PATIENT INTERRUPT control is operated as a reminder that further operation of the unit is not possible without first performing a power-up reset.

F20 - Safety system activated - CPU delay or failure.

This fault is as a result of the CPU system failing either to remove rope tension in response to a PATIENT INTERRUPT operation or to reduce tension if it has increased above the high-force marker. The CPU is allowed a few seconds to take correcting action, after which the safety system takes over control of the motor and attempts to remove tension. If tension still cannot be removed after a further short delay, the power supply to the motor is disconnected, requiring fuse replacement.

Note that this fault indication can occur if the SET HIGH FORCE control is suddenly set to a point far below the current operating tension and the motor is set to a speed that is unable to remove the excess tension in the time allowed.

Clearance of this fault indication is by a power-up reset only.

F30 - External excess-tension detector activated.

This indicates that the rope tension has exceeded the high-force point set up for longer than a pre-set delay. Such a condition may be caused by CPU failure, but is more likely to be caused by the SET HIGH FORCE control being suddenly set to a point far below the current operating tension, particularly if the motor is set to a speed that is unable to remove the excess tension in the time allowed.

F35 - SET HIGH FORCE control range fault.
F36 - SET LOW FORCE control range fault.

These fault indications are given if the SET HIGH FORCE or SET LOW FORCE controls are set to a value higher than that normally expected. Such a condition can occur if the circuitry around the SET HIGH FORCE and SET LOW FORCE controls fails, allowing a higher voltage to be applied to the CPU input circuitry.

Note that a SET HIGH FORCE control range fault indication can only be cleared by a power-up reset.

F40 - Strain-gauge mismatch - Channel 1 < channel 2.

This indicates either that one or both of the channels are wildly out of adjustment or that channel 1 has failed in some way. It could also indicate that the rope was positioned on its pulley in such a way that the strain-gauge beam was being twisted, thus applying more stress to one channel than the other.

F41 - Strain-gauge mismatch - Channel 1 > channel 2.

This indicates either that one or both of the channels are wildly out of adjustment or that channel 2 has failed in some way. It could also indicate that the rope was positioned on its pulley in such a way that the strain-gauge beam was being twisted, thus applying more stress to one channel than the other.

F45 - Strain-gauge fault - Channel 1 excessive offset.
F46 - Strain-gauge fault - Channel 2 excessive offset.

This indicates that the drift-correction system has been unable to find a satisfactory null-point for channel 1 or channel 2 as appropriate, due to excessive drifting of the gauge or a fault in the gauge or its amplifier.

F50 - Ext. zero-tension detector fail - threshold too low.
F51 - Ext. zero-tension detector fail - threshold too high.

The occurrence of either of these two faults indicates that the zero-tension detector has failed to operate at the point expected as the rope tension varies at low values, probably due to mis-adjustment of VR1 on the K3780 CPU board. The threshold is normally set at 3kg or 6lb.

F60 - Power drive fault - no power output.

This fault arises when the K3780 CPU board sends a signal to the motor servo to drive the motor and does not receive subsequent acknowledgement from the power detector on the K3790 power board that the motor is powered. The problem may be caused by a blown fuse on the power board after an F20 situation, by a failure in the power detector circuit around Q11 on the K3790 power board, by failure of the run

signal from the K3780 CPU board to reach the K3790 power board or the feedback signal from the power board to reach the CPU board. On the 16-way cable between the K3780 CPU board and K3790 power board, pin 11 (run) and pin 11 (feedback) can be monitored to check that they go to +5V and 0V respectively when the motor should be starting.

F61 - Power drive fault - uncontrolled power.

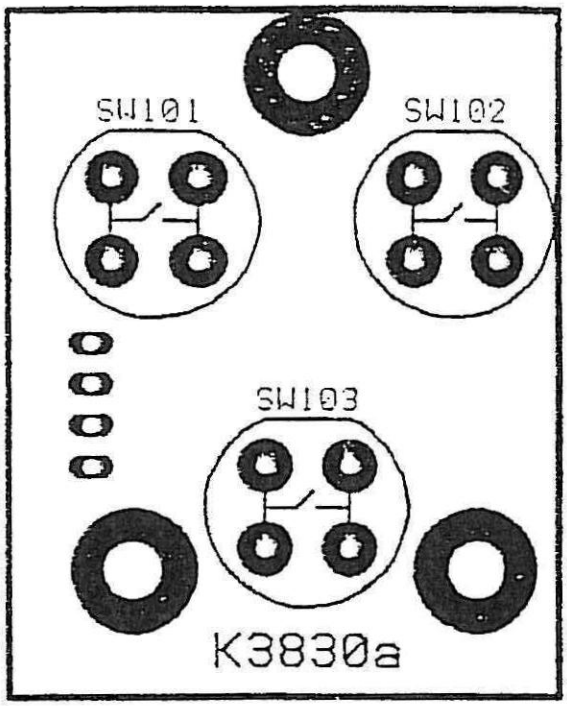
This fault arises when the K3780 CPU board sends a signal to the motor servo to stop the motor and does not receive subsequent acknowledgement from the power detector on the K3790 power board that the motor is stopped. The problem may be caused by a leaky transistor in the motor drive output circuit or by failures as noted for F60.

F70 - Rope drive fault - tension changing incorrectly.

This indicates that the control system is expecting to see the rope tension increasing but has found it decreasing, or vice versa. It may possibly be caused by the failure of the direction signal from the K3780 CPU board to the K3790 power board, which can be checked at pin 10 of the 16-way cable. Exceptionally it could be caused by reversed connections to the motor or by the rope being wrapped around the drum in the wrong direction.

F71 - Rope drive fault - tension not changing.

This indicates that the control system is expecting to see the rope tension change but has found it to be stationary. Such an indication can be given when there is a great deal of slack rope to be wound up at the beginning of a treatment programme. It could possibly be due to a failed rope, gearbox or motor. With the exception of the motor cable, it does not indicate an electrical failure, since this is indicated by F60 or F61 indications, which have higher precedence.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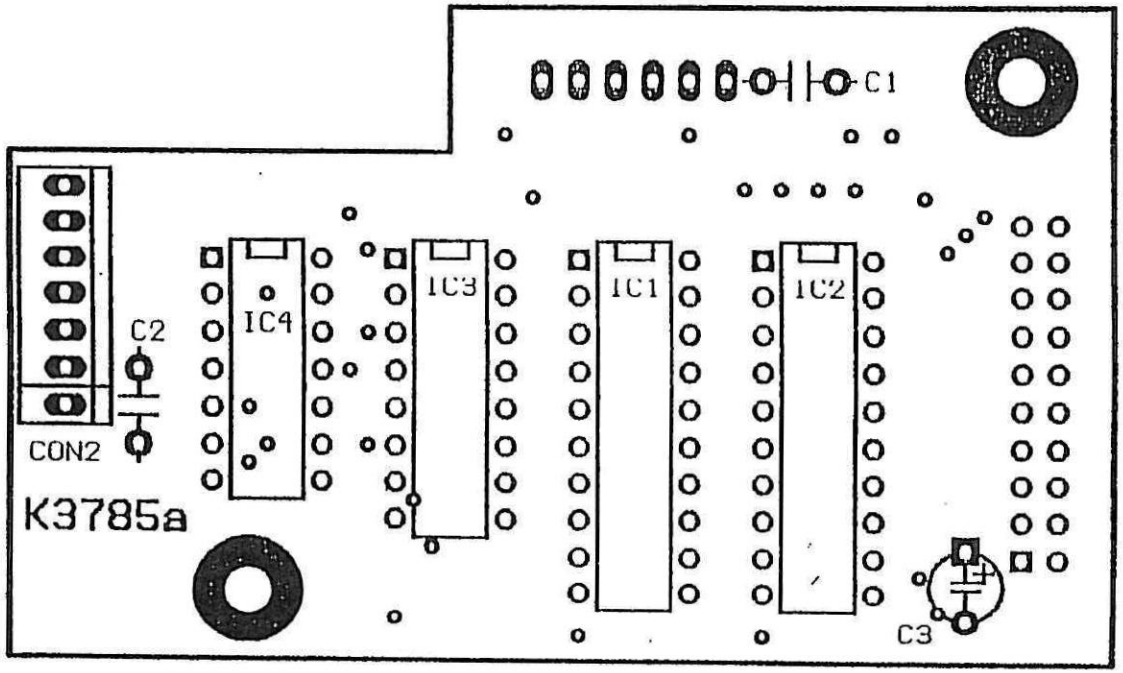
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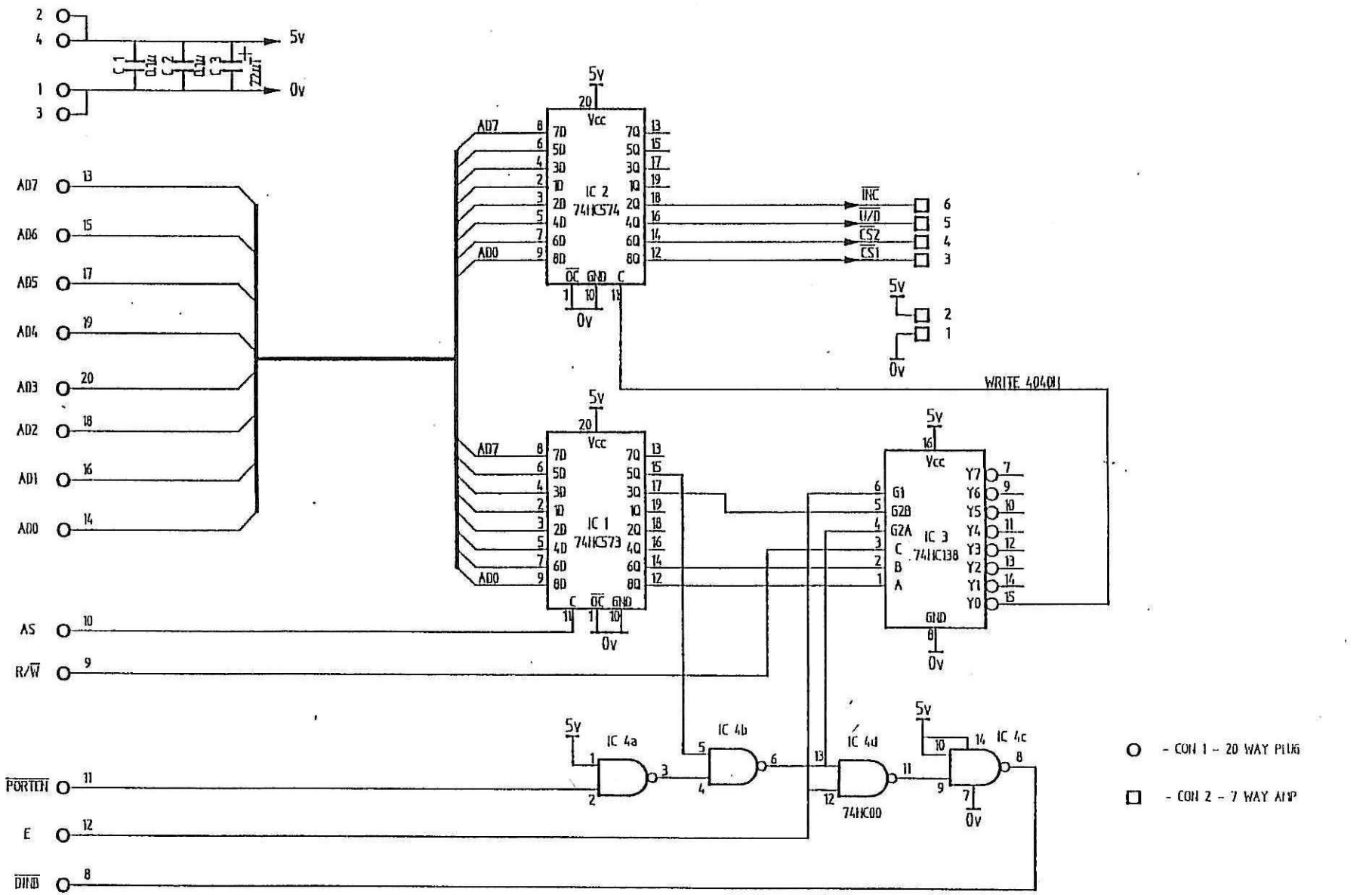

DRAWN	DATE	APPROVED	DATE	TITLE	PROCESSOR AUXILIARY SCHEMATIC μ TRACTION UNIT
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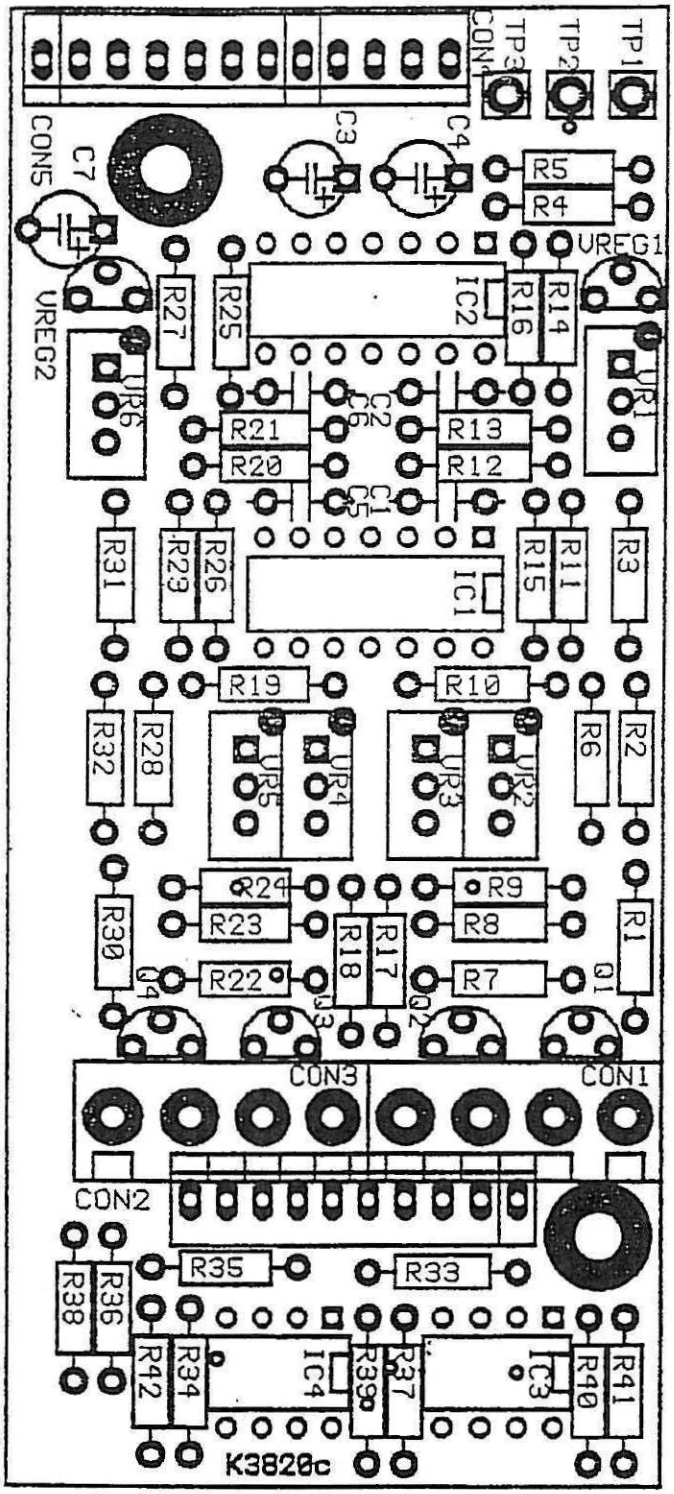
P.C.B. No	K3785a			DRAWING No	2340A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TP2
TP1
CON5
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C4
R5
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R14
VR6
VR1
C6
C2
R21
R13
R20
R12
C5
C1
R31
R23
R26
IC1
R15
R11
R3
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R32
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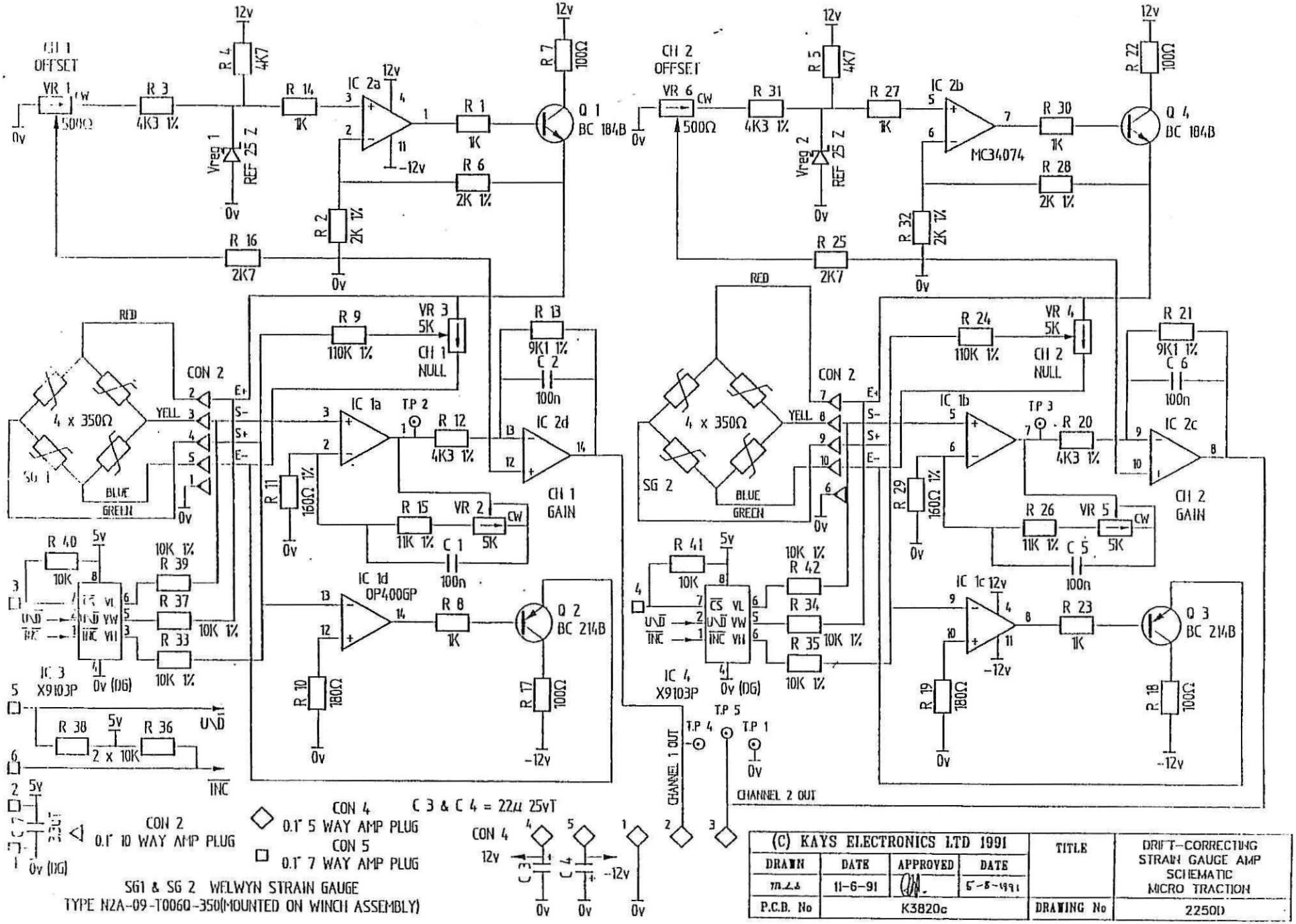
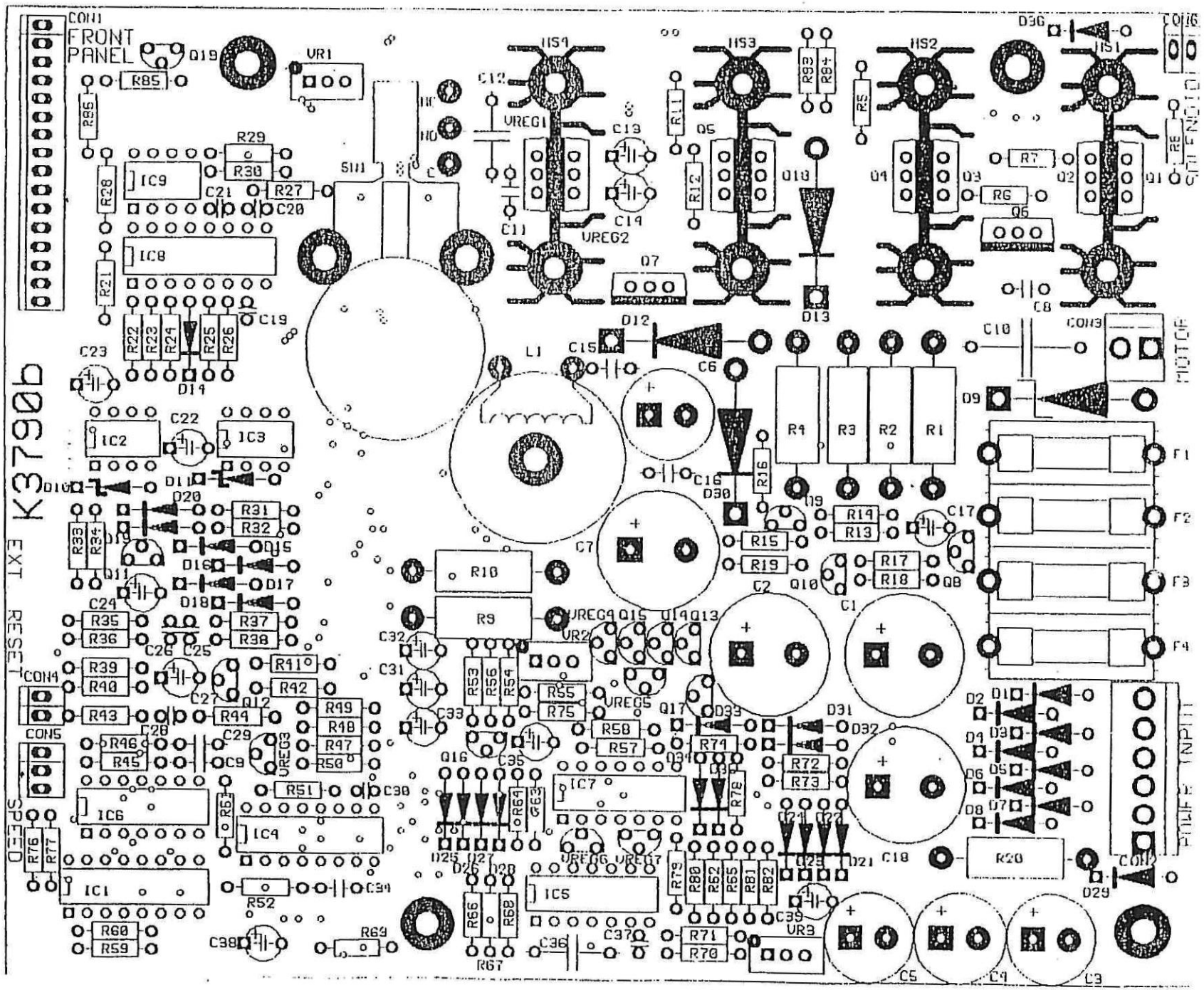


(C) KAYS ELECTRONICS LTD 1991				TITLE	DRIFT-CORRECTING STRAIN GAUGE AMP SCHEMATIC MICRO TRACTION
DRAWN	DATE	APPROVED	DATE		
m.a.s	11-6-91		5-8-1991		
P.C.B. No	K3820c			DRAWING No	22501


K3790b
CON1
FRONT PANEL
VR1
HS4
HS3
HS2
HS1
VREG1
VREG2
SW1
IC9
IC8
IC2
IC3
IC6
IC9
IC1
IC7
IC5
L1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
VREG3
VREG4
VREG5
VREG6
VREG7
VR2
VR3
CON2
CON3
CON4
CON5
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
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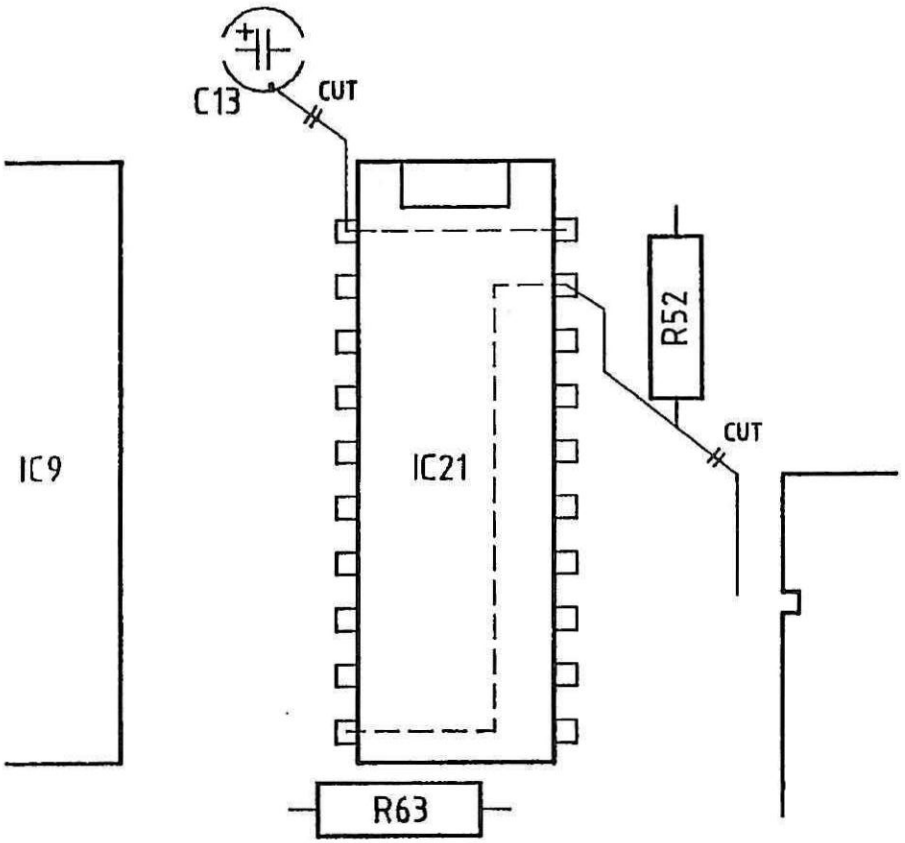
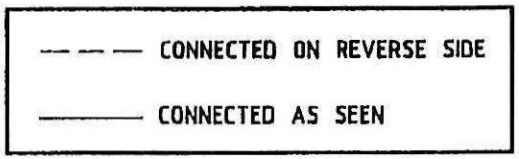
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
C35
C36
C37
C38
C39
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
D25
D26
D27
D28
D29
D30
D31
D32
D33
D34
F1
F2
F3
F4
MOTOR
INPUT
SPEED
EXT RESET

(C) KAYE ELECTRONICS LTD 1991
DRAWN
M.A.A
DATE
5-07-91
APPROVED
KAYE
DATE
15-7-91
PCB No
KAYE
DRAWING No
TITLE
POWER BOARD SCHEMATIC MICRO TRACTION UNIT
2220C

Modification to K3780 to Prevent CPU Bus Conflict.





The purpose of this modification is to prevent the bus buffer IC21 from writing to the CPU bus. This buffer controls data transfer between the CPU and the auxilary board. Since data is never read from the auxilary board by the CPU, the data transfer direction of IC21 may therefore be fixed at 'output', removing any conflicts due to mis-timing of the buffer's enable signal.

The 'DIR' input to IC21 is fixed at logic '1' to achieve the correct direction. The 'G' (enable) input is fixed at logic '0'. These modifications are performed as follows....

1 Remove the auxilary board from the CPU board to gain access to IC21 on the CPU board.

2 Locate IC21, which is near the display interface connector.

3 Locate the track leading to pin 1 ('DIR') of IC21. This appears on the top surface of the board at a via-pad close to the legs of C13, adjacent to the display interface connector.

4 Cut this track at the via-pad.

5 Locate the track leading to pin 19 ('G') of IC21 and one end of the 4K7 resistor R52, which is to the side of IC21.

6 Cut this track between R52 and the 20-way DIL socket CON2.

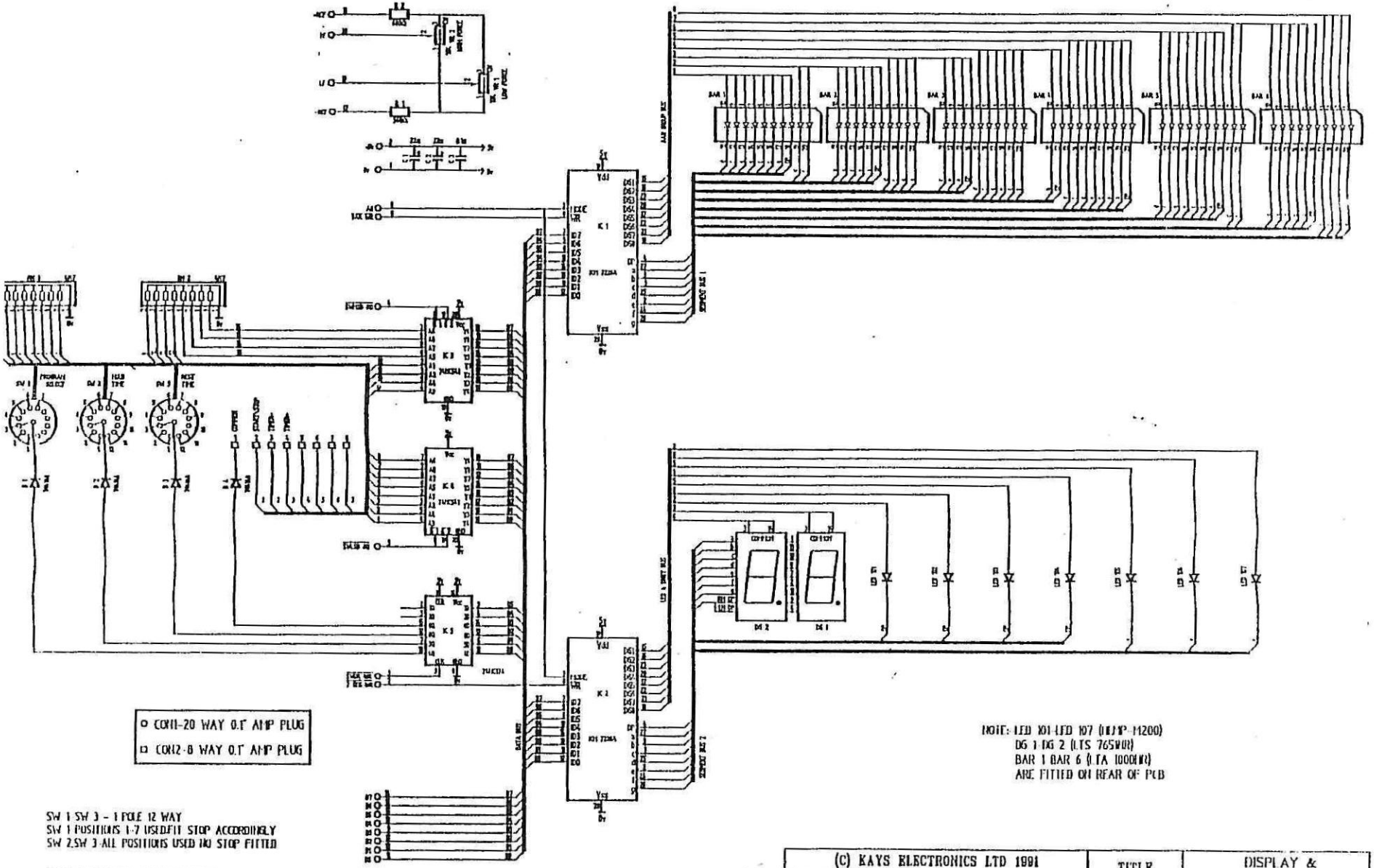
7 Turn the board over.

8 Connect pin 1 of IC21 to pin 20 of IC21 (+5v).

9 Connect pin 19 of IC21 to pin 10 of IC21 (0v).

10 Re-assemble the boards and test thoroughly.

NOT DRAWN TO SCALE



CON1-20 WAY 0.1" AMP PLUG

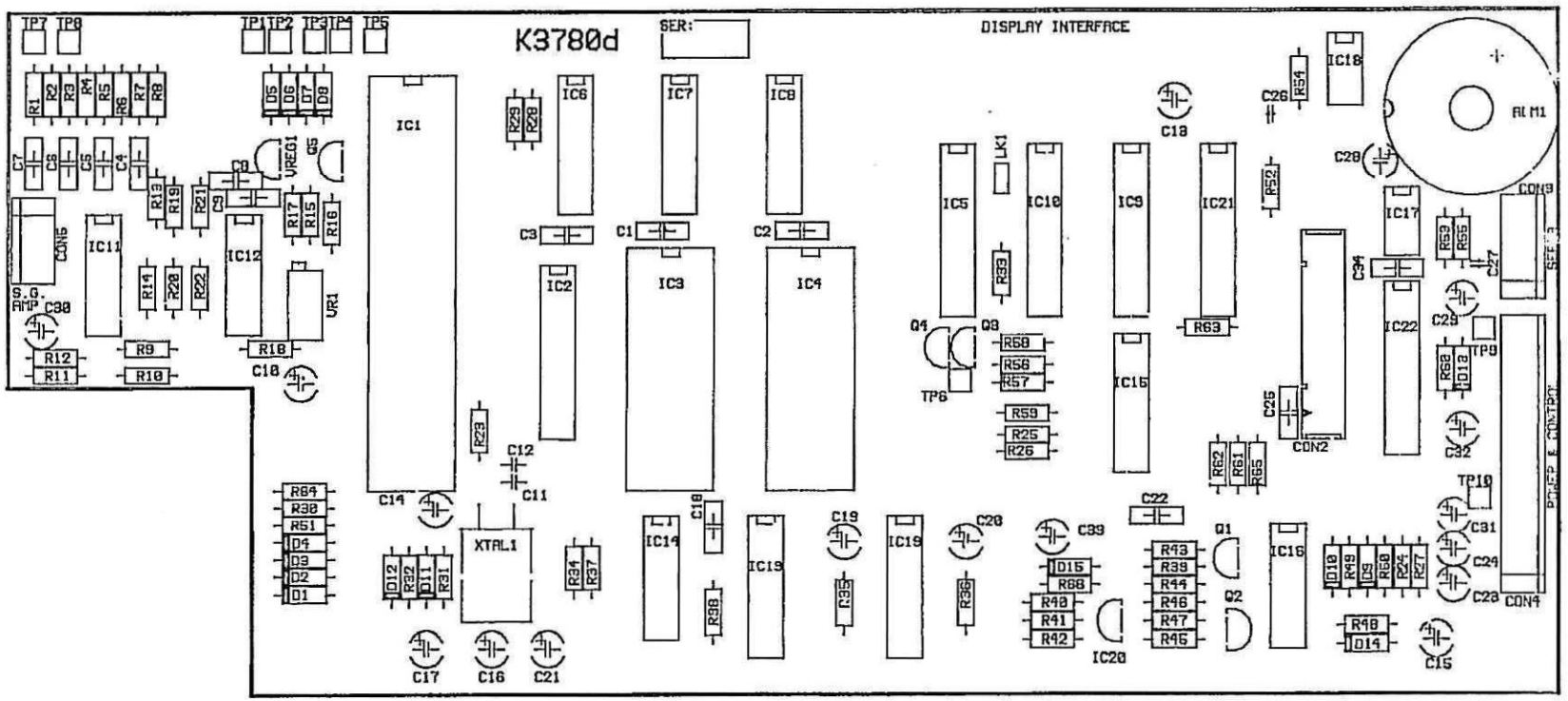
CON2-8 WAY 0.1" AMP PLUG

SW 1 SW 3 - 1 POLE 12 WAY
SW 1 POSITIONS 1-7 USED FIT STOP ACCORDINGLY
SW 2 SW 3 ALL POSITIONS USED NO STOP FITTED

NOTE:- VR 1 VR 2 & SW 1 SW 3 MOUNTED WITH SHAFT PROTRUDING FROM REAR OF PCB

NOTE: LED 101-LED 107 (HLMP-M200)
DG 1 DG 2 (LTS 765WUR)
BAR 1 BAR 6 (LTA 1000HR)
ARE FITTED ON REAR OF PCB

(C) KAYS ELECTRONICS LTD 1991				TITLE	DISPLAY & CONTROL BOARD SCHEMATIC MICRO TRACTION UNIT
DRAWN	DATE	APPROVED	DATE		
M.Z.A	3-07-91				
P.C.B. No	K3770			DRAWING No	2165


K3780d
SER:
DISPLAY INTERFACE
TP7
TP8
TP1
TP2
TP3
TP4
TP5
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
IC9
IC10
IC11
IC12
IC13
IC14
IC15
IC16
IC17
IC18
IC19
IC20
IC21
IC22
XTAL1
VR1
VREG1
LK1
Q1
Q2
Q3
Q4
CON2
CON3
CON4
CON5
CON6
ALM1
TP6
TP9
TP10
S.G.
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
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R41
R42
R43
R44
R45
R46
R47
R48
R49
R50
R51
R52
R53
R54
R55
R56
R57
R58
R59
R60
R61
R62
R63
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
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C32
C33
C34
D1
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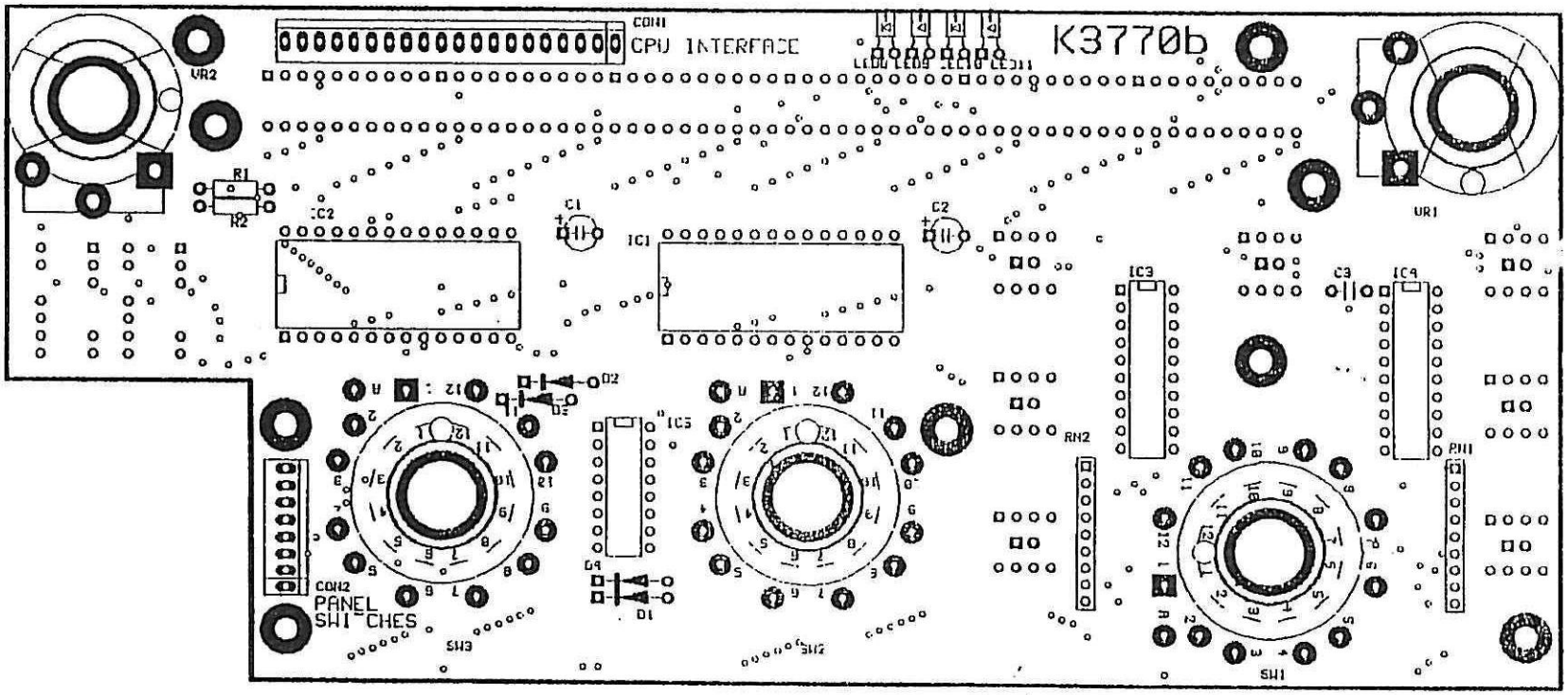
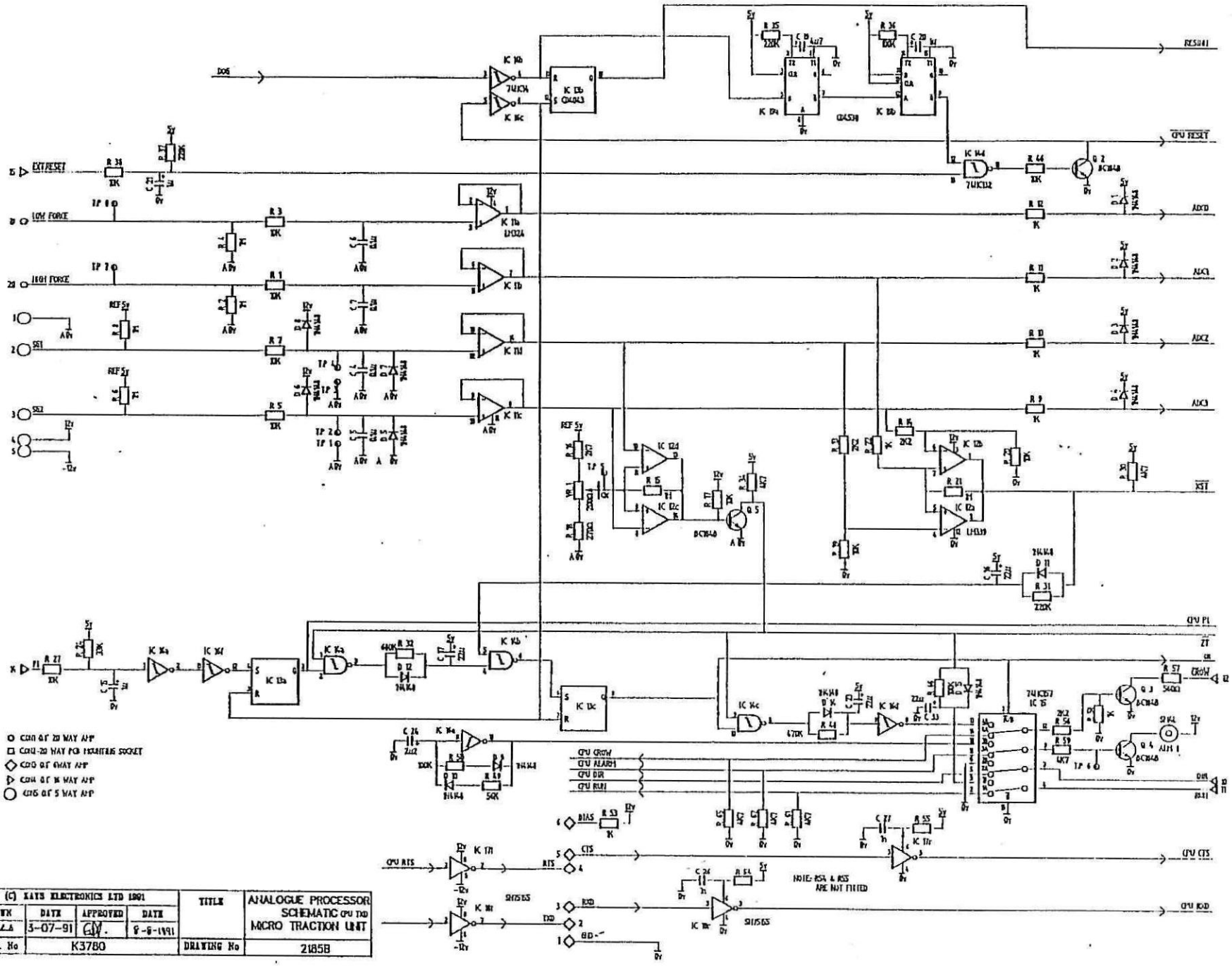
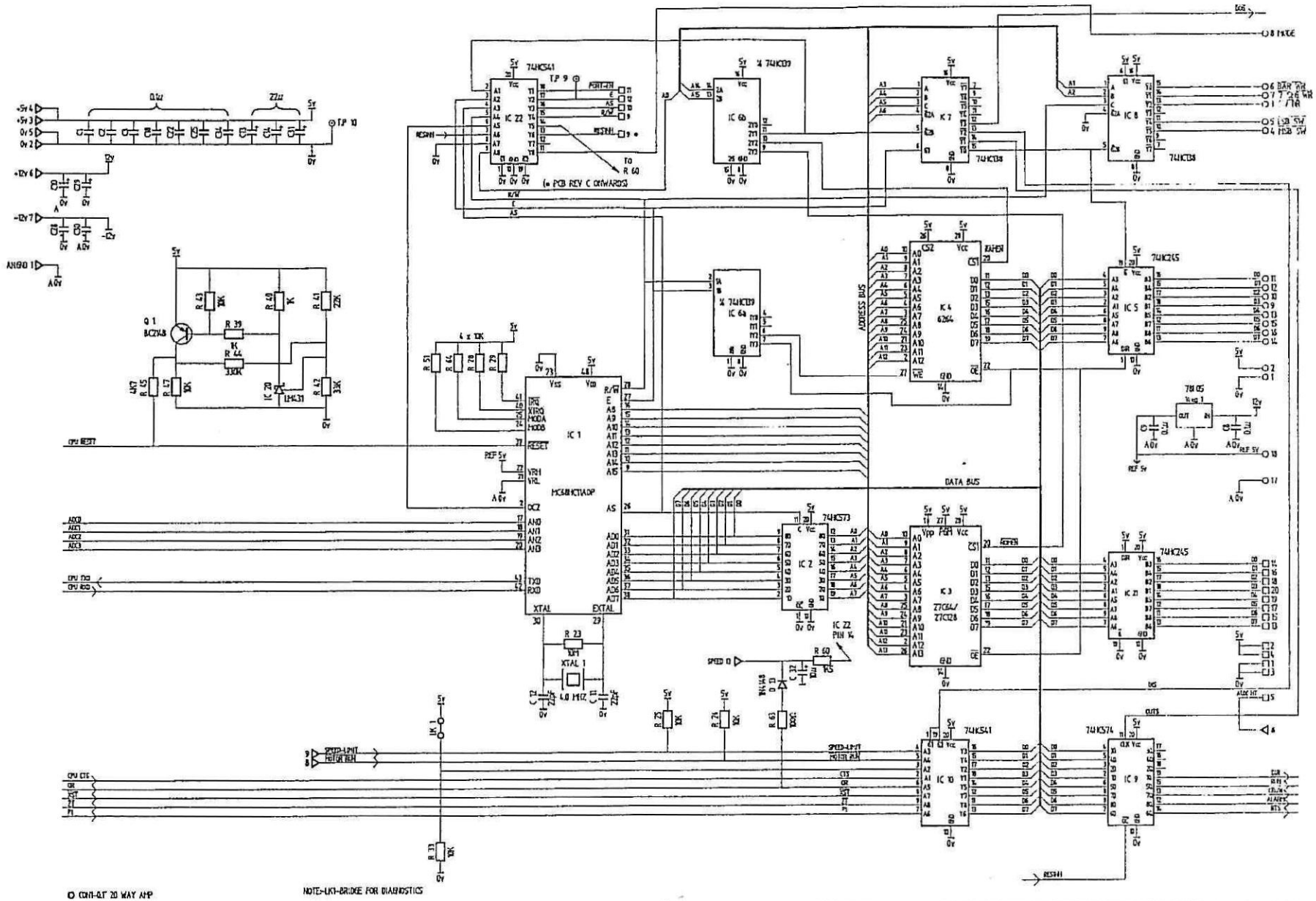
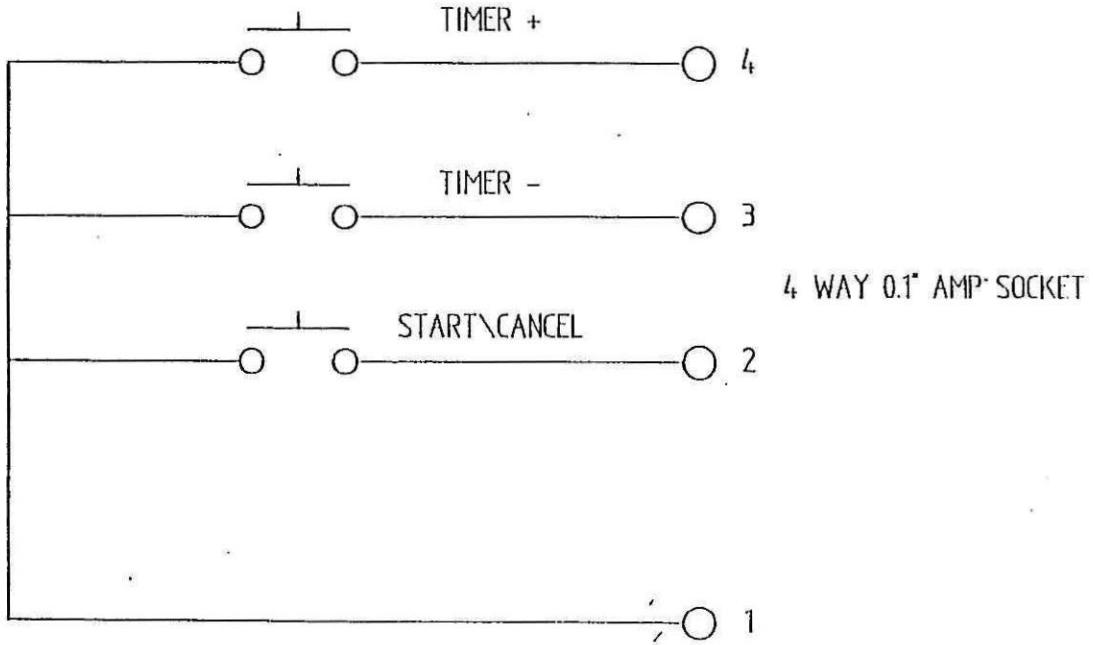
D15
D16
D17
D18
PROG & CONTROL


K3770b
CPU INTERFACE
CON1
VR2
VR1
R1
R2
C1
C2
IC1
IC2
IC3
IC4
IC5
C3
RN1
RN2
D1
D2
D3
D4
SW1
SW2
SW3
CON2
PANEL
SWITCHES

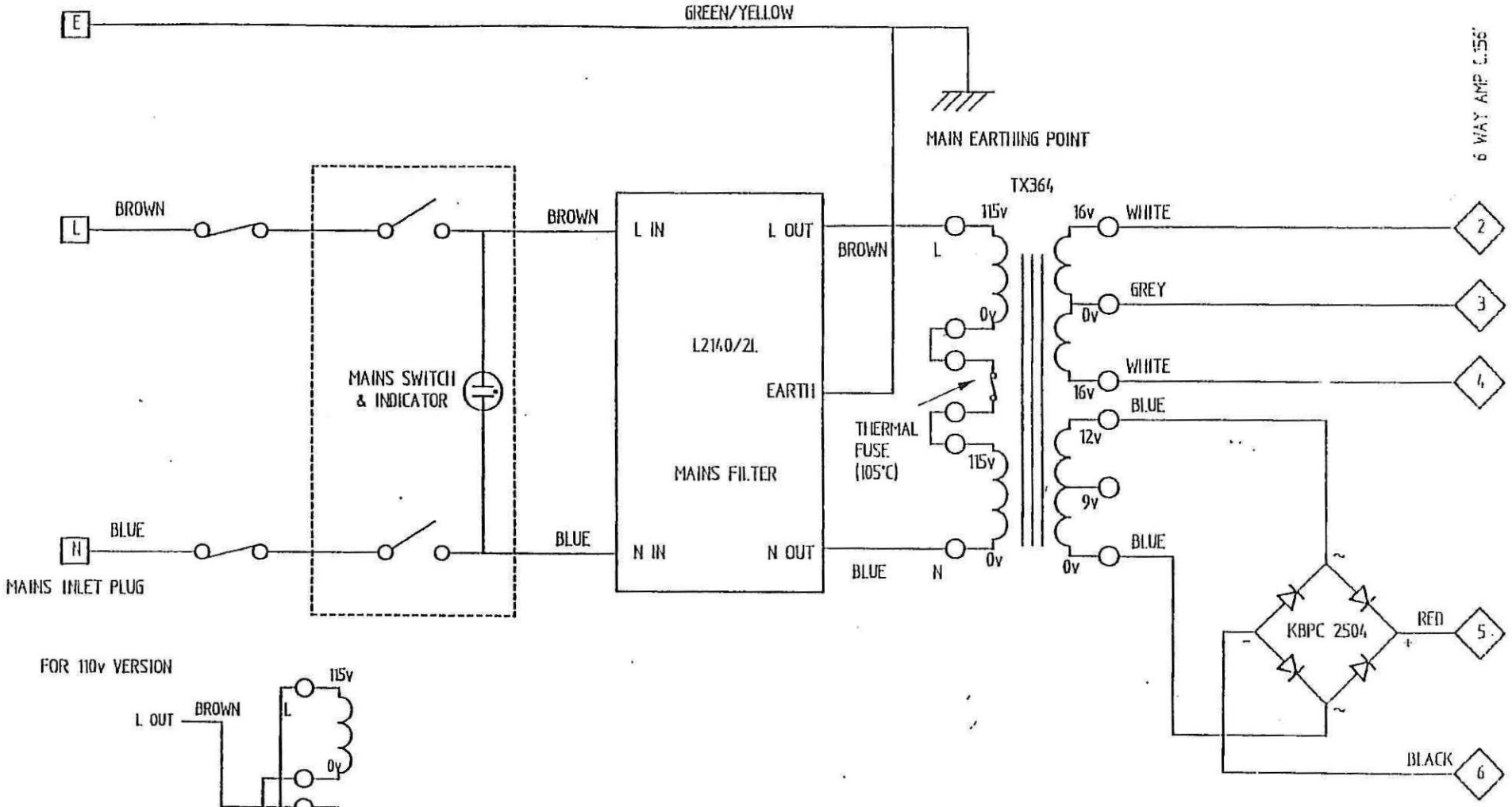


(C) KAYE ELECTRONICS LTD 1991				TITLE	ANALOGUE PROCESSOR SCHEMATIC CPU TXD MICRO TRACTION UNIT
DRAWN	DATE	APPROVED	DATE		
M.J.A	3-07-91	G.W.	9-8-1991		
P.C.B. No	K3780			DRAWING No	2185B


ADDRESS BUS
DATA BUS
CPU RESET
NOTE-LK1-BRIDGE FOR DIAGNOSTICS
(c) KAYS ELECTRONICS LTD 1991
TITLE
MICRO PROCESSOR SCHEMATIC MICRO TRACTION UNIT
DRAWN
DATE
APPROVED
DATE
3-07-91
27/5/13
P.C.B. No
K3780
DRAWING No
21800



DRAWN	DATE	APPROVED	DATE	TITLE	PUSH BUTTON ASSEMBLY SCHEMATIC MICRO TRACTION UNIT
M.K.Y	3-07-91	GH	4/7/91		
P.C.B. No	K3830			DRAWING No	2345A

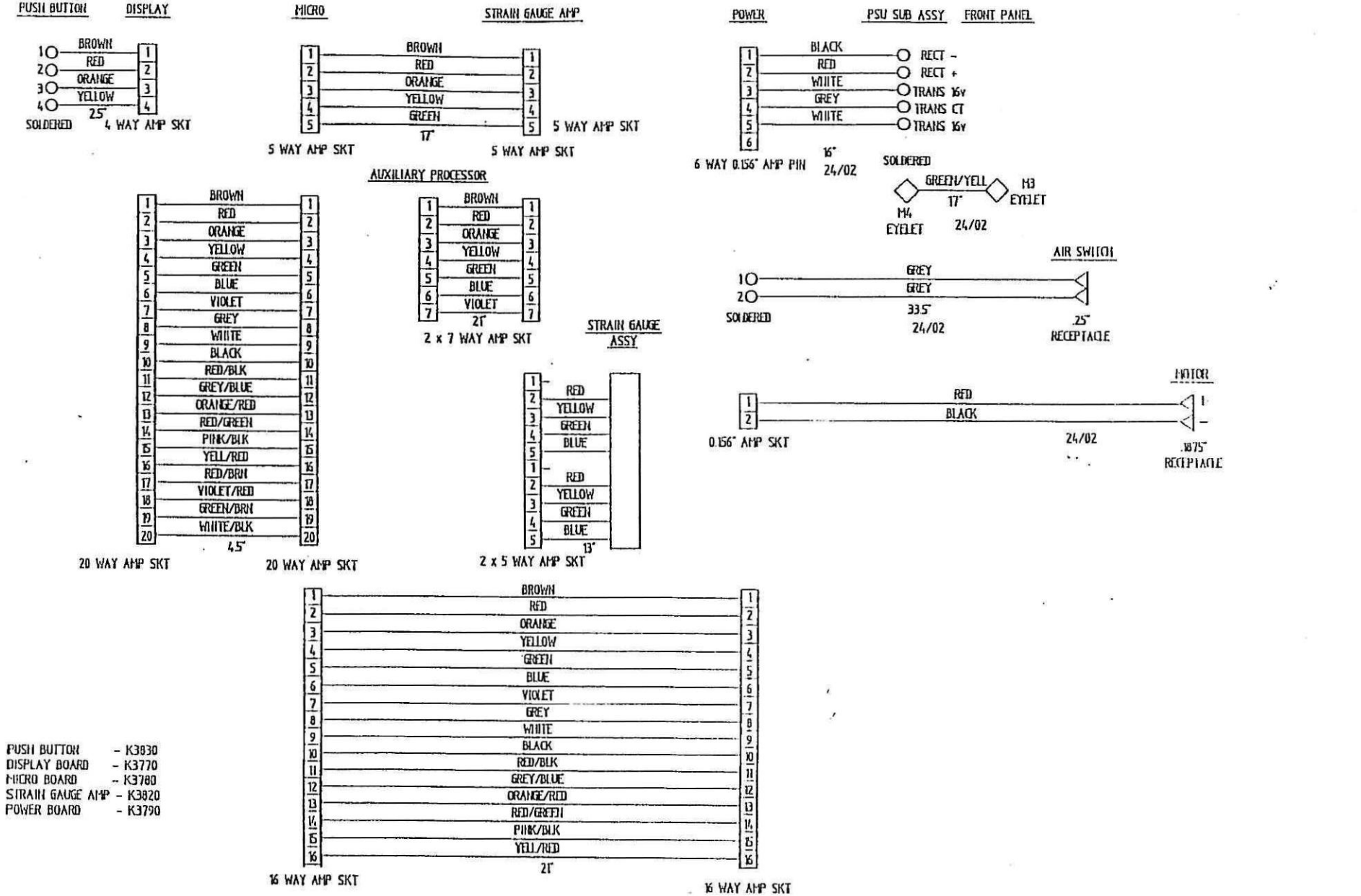


110v 5A(f) FUSES
240v 2A(f) FUSES

CUT CABLE 470mm
FROM EDGE OF RECTIFIER BRACKET

ALL CABLE 24/0.2
UNLESS OTHERWISE STATED

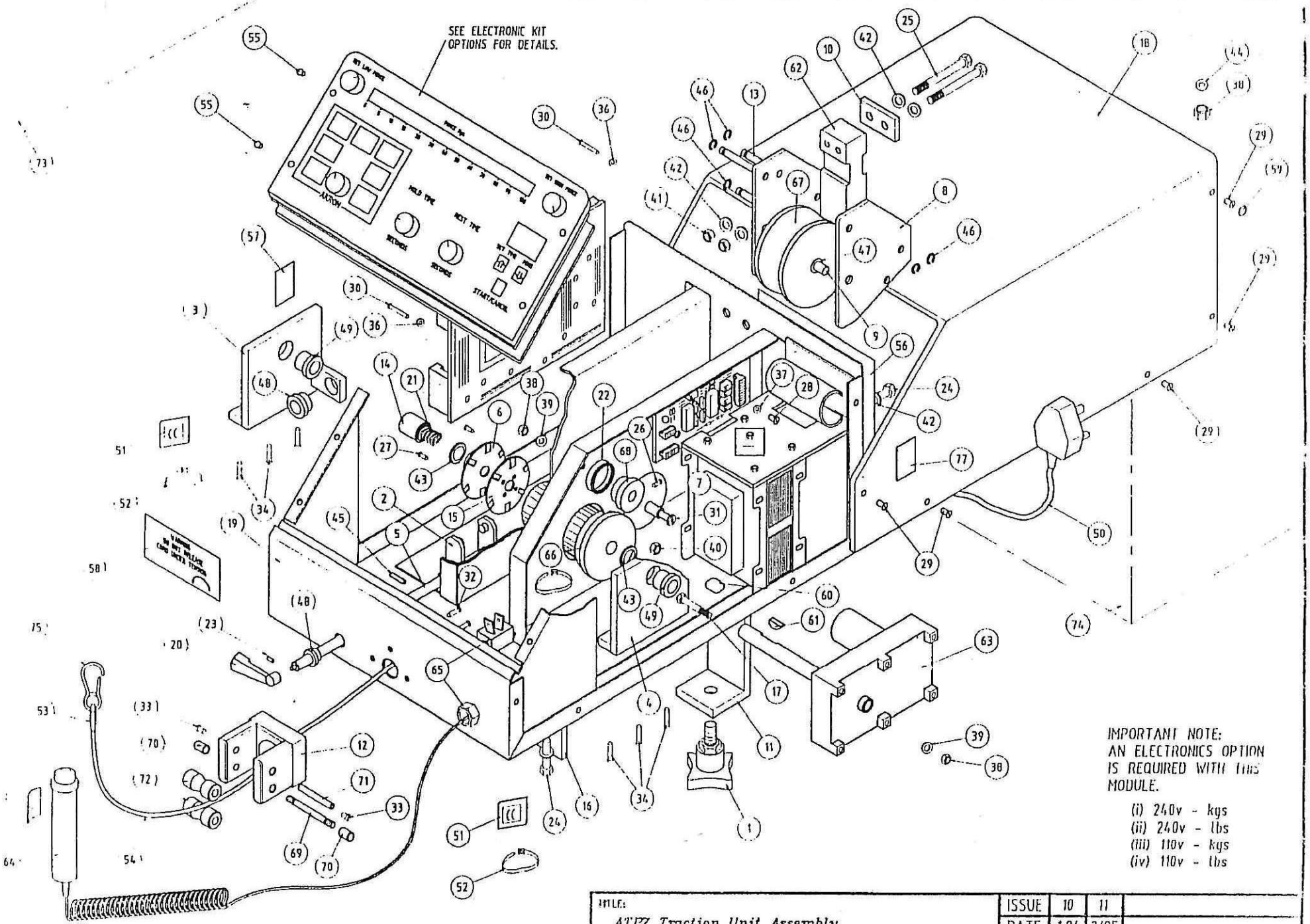
DRAWN	DATE	APPROVED	DATE	TITLE	240/110v POWER SUPPLY WIRING MICRO TRACTION UNIT
A.E.S	22-5-91	MB	2-8-91		
P.C.B. No		—		DRAWING No	2320D



PUSH BUTTON - K3830
DISPLAY BOARD - K3770
MICRO BOARD - K3780
STRAIN GAUGE AMP - K3820
POWER BOARD - K3790

ALL CABLE 7/02 UNLESS OTHERWISE STATED

DRAWN	DATE	APPROVED	DATE	TITLE	INTERCONNECT WIRING MICRO TRACTION UNIT
M.E.S	16-07-91	MB	2-8-91		
P.C.B. No				DRAWING No	2350A



IMPORTANT NOTE:
AN ELECTRONICS OPTION IS REQUIRED WITH THIS MODULE.

(i) 240v - kgs
(ii) 240v - lbs
(iii) 110v - kgs
(iv) 110v - lbs

TITLE:		ISSUE	10	11	
ATP7 Traction Unit Assembly.		DATE	1:94	2/95	
+ATP7		ECN	593	683	

+ATP7 TRACTION MACHINE (Phantom) Revn 26 PLH 16.03.9

Stock Number	Description	Quantity	Ref.	Class
2J5077Z	.STAR KNOB ASSY M12 x 70	1	1	Pl
3A7101Z/1	.ATP7 CLUTCH RELEASE YOKE	1	2	
3A7102Z/1	.MCS SUPPORT BRACKET	1	3	
3A7103Z/1	.MOTOR SUPPORT BRACKET	1	4	
3A7104Z/3	.CLUTCH RELEASE SHAFT	1	5	Pur
3A7105Z	.CLUTCH PLATE & BOSS	1	6	
3A7106Z	.SPRING DRUM SPINDLE	1	7	
3A7107Z/4	.PULLEY SIDE CHEEK	2	8	Pur
3A7108Z	.PULLEY SPINDLE	1	9	Pur
3A7109Z/1	.SPACER	1	10	
3A7110Z	.CHASSIS MOUNTING BRACKET	1	11	
3A7113Z/2	.ROLLER BRACKET	1	12	
3A7117Z/1	.GROOVED PIN	3	13	
3A7118Z/1	.SPACER TUBE	1	14	
3A7119Z	.CLUTCH PLATE WITH HOLES	1	15	
3A7121Z/4	.TRACTION CLAMP	1	16	
3A7124Z/1	.THREADED SPACER	1	17	
3A7125Z/4	.TRACTION UNIT LID	1	18	
3A7126Z/7	.TRACTION CHASSIS PAINTED	1	19	
3F7120Z	.CLUTCH RELEASE LEVER	1	20	Pl
5G6700Z	.SPRING 33x14.5x5x19SWG	1	21	Pur
5G6800Z	.SPRING MOTOR SR105	1	22	Pur
5J4602J	.GRUB SCREW 4BA x 3/16"	1	23	Bulk
5J7858N	.SET SCREW HEX HT M8 x 20	3	24	Bulk
5J7866A	.BOLT HEX HT M8 x 60	2	25	Bulk
5K0205X	.SCREW No.6 x 3/8 SELFTAP	1	26	Bulk
5K0209Z	.SCREW No.6 x 3/4 CSK ST	4	27	Bulk
5K1032N	.SCREW M3 x 6 PAN HD POZI	2	28	Bulk
5K1033J	.SCREW M3 x 8 RAISED CSK	10	29	Bulk
5K1045R	.SCREW M3 x 16 PAN POZI	4	30	Bulk
5K1138U	.SCREW M5 x 25 PAN HEAD	1	31	Bulk
5K1832U	.SCREW M4 x 6 PAN HEAD	3	32	Bulk
5K1835J	.SCREW M4 x 12 SLOTTED	2	33	Bulk
5K1835K	.SCREW M4 x 12 CSK FLAT	10	34	Bulk
5L0362V	.FLAT WASHER 1/4"	1	35	Bulk
5L2655K	.SHAKEPROOF WASHER M3	4	36	Bulk
5L2677K	.NYLON WASHER M3	2	37	Bulk
5L2819C	.NYLOC NUT M5	2	38	Bulk
5L2865K	.WASHER FORM B M5	1	39	Bulk
5L2919C	.NYLOC NUT M6	2	40	Bulk
5L3119C	.NYLOC NUT M8	3	41	Bulk
5L3162K	.WASHER FLAT FORM B M6	6	42	Bulk
5L4584R	.WASHER NGS 0.515"x0.902	2	43	Bulk
5L5355K	.SHAKEPROOF WASHER 2BA	1	44	Bulk
5M0206A	.SELOC PIN 1/8" x 3/4"	1	45	Bulk
5M2234S	.CIRCLIP	7	46	Bulk
5P8204E	.NEEDLE ROLLER BEARING	2	47	Pur
5P8827Z	.FLANGED NYLON BUSH M10	2	48	Bulk

ATP7 TRACTION MACHINE (Phantom) Revn 26 PLH 16.03.9

Stock Number	Description	Quantity	Ref.	Class
5P8922Z	.HEADED BUSH 12x24x15.6	2	49	Bulk
5S0252Z	.MAINS LEAD 6A/250Vx3.5M	1	50	Pur
5S0307Z	.CABLE TIE BASE	2	51	Bulk
5S0315Z	.CABLE TIE RS 543-428	2	52	Bulk
5S0346Z	.CABLE HEAT SHRINK 9/3	0.03	53	Bulk
5T7200Z	.ROPE 4mm ARAMIDE	1	54	Pur
5T7300Z	.PUSH IN PANEL POPPER	4	55	Bulk
5U1040Z	.LABEL ATP7 SERIAL/FUSING	1	56	Bulk
5U1041Z	.ATP7 FUSE RATING LABEL	1	57	Pur
5U1042Z	.CLUTCH RELEASE LABEL	1	58	Pur
5U1043Z	.TAMPER PROOF LABEL	1	59	Bulk
5U1044Z	.EARTH LABEL RS 504-978	1	60	Bulk
5X0052Z	.WOODRUFF KEY 1/8" x 1.2"	1	61	Pur
5X0060Z/1	.STRAIN GAUGE BEAM ASSY	1	62	Pur
5X0061Z/2	.MOTOR GEARBOX 4305-1B0	1	63	Pur
5X0062Z	.AIR PUSH BUTTON	1	64	Pur
5X0065Z	.AIR MICROSWITCH INC.NUT	1	65	Pur
5X0080Z/3	.ROPE DRUM	1	66	Pur
5X0081Z/1	.PULLEY WHEEL	1	67	Pur
5X0082Z	.SPRING DRUM	1	68	Pur
5X0092Z	.STUDDED ROLLER SPINDLE	1	69	Pur
5X0093Z	.THREADED END CAP	2	70	Pur
5X0094Z	.SHORT ROLLER SPINDLE	1	71	Pur
5X0095Z/1	.TRACTION ROLLER	2	72	Pur
5Z0061Z	.INSTAPAK FITTINGS (ATP7)	1	73	Pur
5Z0062Z	.TRACTION CARTON	1	74	Pur
8A4000Z	.CARBINE HOOK 60mm	1	75	Pur
8A7400Z	.VELCRO LOOP 20mm S/A	0.03	76	Bulk
8A7500Z	.VELCRO HOOK 20mm S/A	0.03	77	Bulk

End of Report

AKRON THERAPY PRODUCTS M I C R O S S 3.84 DATE 10.10.91

BOM210 PARTS LIST - HIGHEST LEVEL PAGE 1

X0066Z ATP7 ELECTRONICS 240/KGS Revision 01 PLH 10.10.91

Stock number	Description	Quantity	Ref.	Class.
5X0045Z	.FRONT PANEL KGS	1	66	Pur
5X0046Z	.STRAIN GAUGE AMPLIFIER	1	67	Pur
5X0048Z	.POWER SUPPLY 240V	1	68	Pur
5X0050Z	.MOTOR DRIVE P.C.B.	1	69	Pur

AKRON THERAPY PRODUCTS M I C R O S S 3.84 DATE 10.10.91

BOM210 PARTS LIST - HIGHEST LEVEL PAGE 1

5X0067Z ATP7 ELECTRONICS 240/LBS Revision 01 PLH 10.10.91

Stock number	Description	Quantity	Ref.	Class.
5X0044Z	.FRONT PANEL LBS	1	66	Pur
5X0046Z	.STRAIN GAUGE AMPLIFIER	1	67	Pur
5X0048Z	.POWER SUPPLY 240V	1	68	Pur
5X0050Z	.MOTOR DRIVE P.C.B.	1	69	Pur

AKRON THERAPY PRODUCTS M I C R O S S 3.84 DATE 10.10.91

BOM210 PARTS LIST - HIGHEST LEVEL PAGE 1

5X0068Z ATP7 ELECTRONICS 110/KGS Revision 01 PLH 10.10.91

Stock number	Description	Quantity	Ref.	Class.
5X0045Z	.FRONT PANEL KGS	1	66	Pur
5X0046Z	.STRAIN GAUGE AMPLIFIER	1	67	Pur
5X0049Z	.POWER SUPPLY 120V	1	68	Pur
5X0050Z	.MOTOR DRIVE P.C.B.	1	69	Pur

AKRON THERAPY PRODUCTS M I C R O S S 3.84 DATE 10.10.91

BOM210 PARTS LIST - HIGHEST LEVEL PAGE 1

5X0069Z ATP7 ELECTRONICS 110/LBS Revision 01 PLH 10.10.91

Stock number	Description	Quantity	Ref.	Class.
5X0044Z	.FRONT PANEL LBS	1	66	Pur
5X0046Z	.STRAIN GAUGE AMPLIFIER	1	67	Pur
5X0049Z	.POWER SUPPLY 120V	1	68	Pur
5X0050Z	.MOTOR DRIVE P.C.B.	1	69	Pur

End of Report

ATP7 TRACTION MACHINE MECHANICAL MAINTENANCE

The following checks should be carried out every six months.

Disconnect machine from main supply.

Remove cover from chassis by undoing the 10 - M3 pan head screws. Note the shorter 6mm long screw fitted by the transformer.

Remove earth connection to cover.

Check the bottom bolt holding the mounting bracket to the chassis for tightness - tighten if required. The two bolts holding the strain gauge beam to the chassis are tightened to 15ft/lbs and should not be adjusted.
Check the set screws holding the two bearing brackets to the chassis are tight - tighten if required.
Check that the retaining screw and operating knob are tight on the clutch operating shaft - tighten if required.
Check the bolt holding the spring motor to the chassis - tighten if required.
Check bolts holding transformer to chassis - tighten if required.
Check correct operation of the clutch. If it is not free in action, lightly oil the shaft on which the clutch slides. The action should require firm pressure on the operating knob with no tension on the rope. If the action is still sticking or over tight, the clutch plate must be removed and the key way and key checked for burrs.
Check the rope drum clutch plate is secured firmly to the rope drum. If the retaining screws are loose, the clutch bearing bracket and operating mechanism must be removed, so that the four screws holding the clutch plate to the rope drum can be tightened. Reassemble, lightly oiling the shaft under the sliding clutch plate boss.
Lightly oil both the rope drum shaft bearings and the clutch operating mechanism.
Note the rope pulley side plates are attached to the measuring beam by a single bolt. The bolt must NOT be tightened to grip the measuring beam, but should retain the pulley shaft and allow the pulley and slide plates to move up and down freely.

Check that the three screws securing the rope roller block to the front of the chassis are tight - tighten if required.
Check the two set screws holding the top rope guide roller shaft are tight - tighten if required.
Check the two extension shafts are tight on the bottom rope and guide roller shaft - tighten if necessary.
Inspect the traction rope for wear. If unduly frayed it should be replaced.
Note only a genuine replacement traction rope should be used on this machine.

To Replace Traction Rope.

First, fully extend the existing rope and cut off traction hook.
Temporarily join the cut end of the existing rope to the end of the new rope, binding them together with sewing thread.
Cut the old rope at its attachment point to the rope drum and gently pull the old rope through the Traction Machine, drawing the new rope through the rollers and round the rope pulley.
Remove old rope completely by undoing the thread and feed new rope through the hole inside of the rope drum, first having removed the knot from the old rope.
Draw the new rope out through the side of the pulley and tie firmly a double knot close to the end.
Trim rope to within half an inch of knot, seat knot in edge of rope drum, by gradually increasing tension in the traction rope.
Check end of rope is tucked well into the edge of the rope drum with the knot.
Holding the rope hook, release the clutch and gradually let the rope retract. Check for free movement of the rope in both directions.

ATP7 Traction Machine

Programme 1

STATIC

HF = High Force
L = Low Force
H = Hold Time
R = Rest Time
D = Difference High - Low Force
F = 1/5 High Force

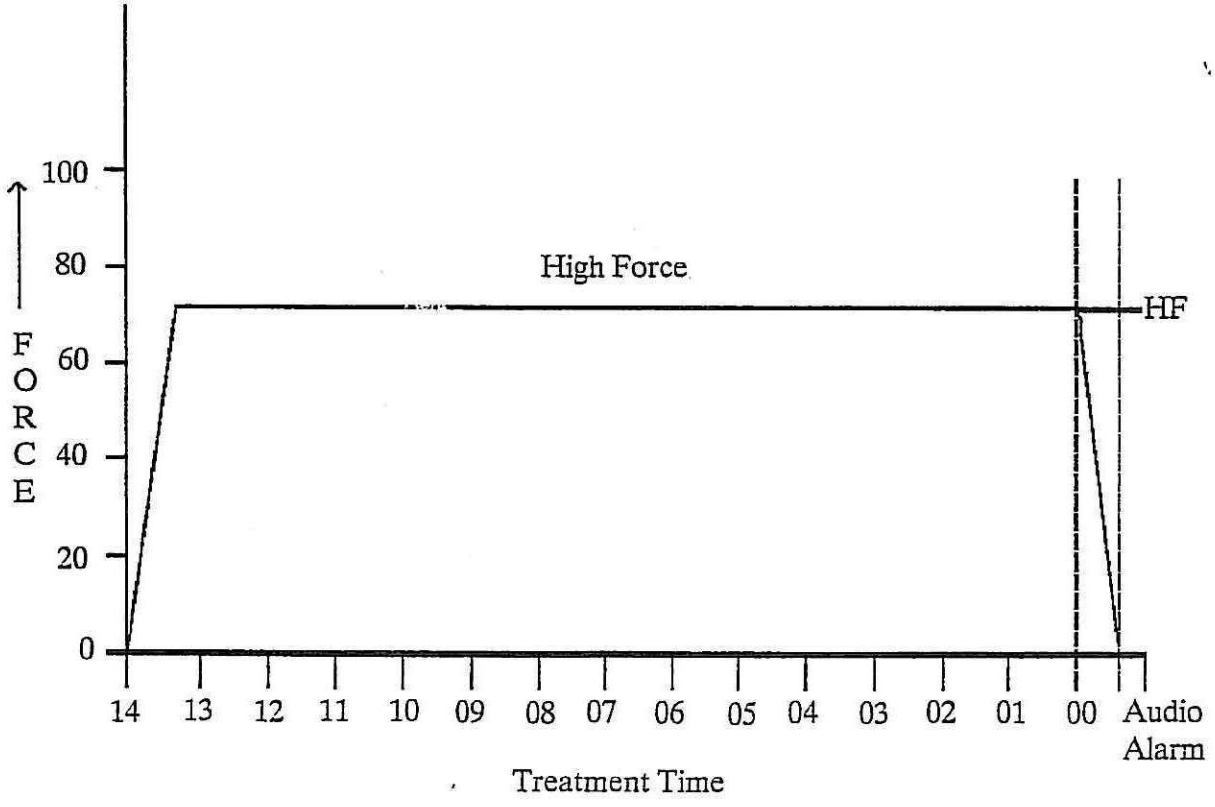
Options

Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	14 min
Hold Time	=	N/A
Rest Time	=	N/A
High Force	=	75
Low Force	=	N/A

Sustained traction is applied at the selected traction force throughout treatment time. The machine pulls at a constant speed to this level at the start of treatment and releases in the same manner at the end of treatment time. An audio alarm signals when the force returns to zero.



Programme 2 *Progressive - Regressive, Static*

HF	=	High Force
L	=	Low Force
H	=	Hold Time
R	=	Rest Time
D	=	Difference High - Low Force
F	=	1/5 High Force

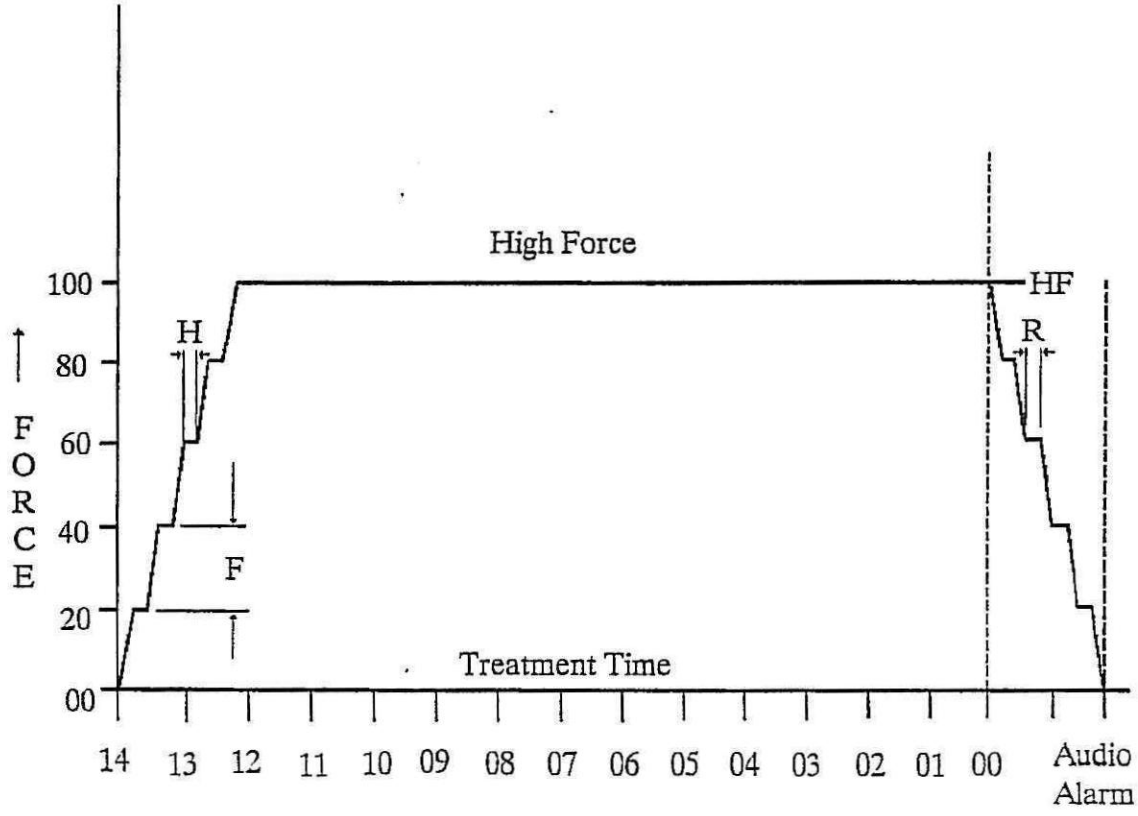
Options

Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	14 min
Hold Time	=	20 sec
Rest Time	=	20 sec
High Force	=	100
Low Force	=	00

The progressive/regressive facility provides a graduated pull in steps to the maximum force selected for sustained traction. At the end of treatment time, the machine releases in graduated steps down to zero. The audio alarm signals when the force returns to zero at the end of treatment time. The size of each step or pull is 1/5th of the maximum force selected and a delay/pause between each step can be pre-set using the "hold timer" at the start of treatment and the "rest timer" for the release at the end of the programme.



Programme 3 — *Intermittent*

HF	=	High Force
L	=	Low Force
H	=	Hold Time
R	=	Rest Time
D	=	Difference High - Low Force
F	=	1/5 High Force

Options

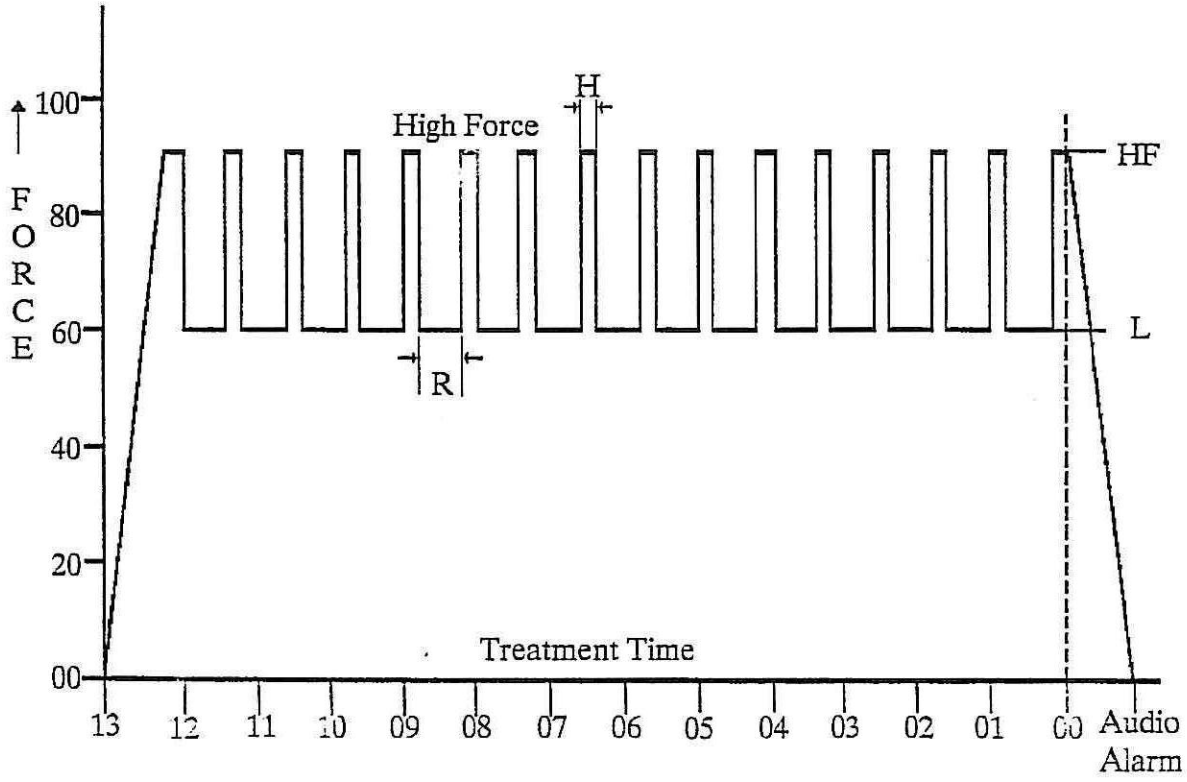
Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	13 min
Hold Time	=	12 sec
Rest Time	=	30 sec
High Force	=	95
Low Force	=	60

Intermittent traction is applied using two force levels. The machine pulls and releases at a constant speed to the pre-set high force level and the pre-set low force or zero setting.

The machine can be set to "hold" for a period of 0 - 60 seconds at the high force level and a "rest" period of 0 - 60 seconds at the low force or zero level. At the end of treatment, the machine will release to zero and the audio alarm will sound.



ATP7 Traction Machine

Progressive - Regressive With Stepped Intermittent

Programme 4

HF	=	High Force
L	=	Low Force
H	=	Hold Time
R	=	Rest Time
D	=	Difference High - Low Force
F	=	1/5 High Force
DF	=	1/5 Difference High/Low Force

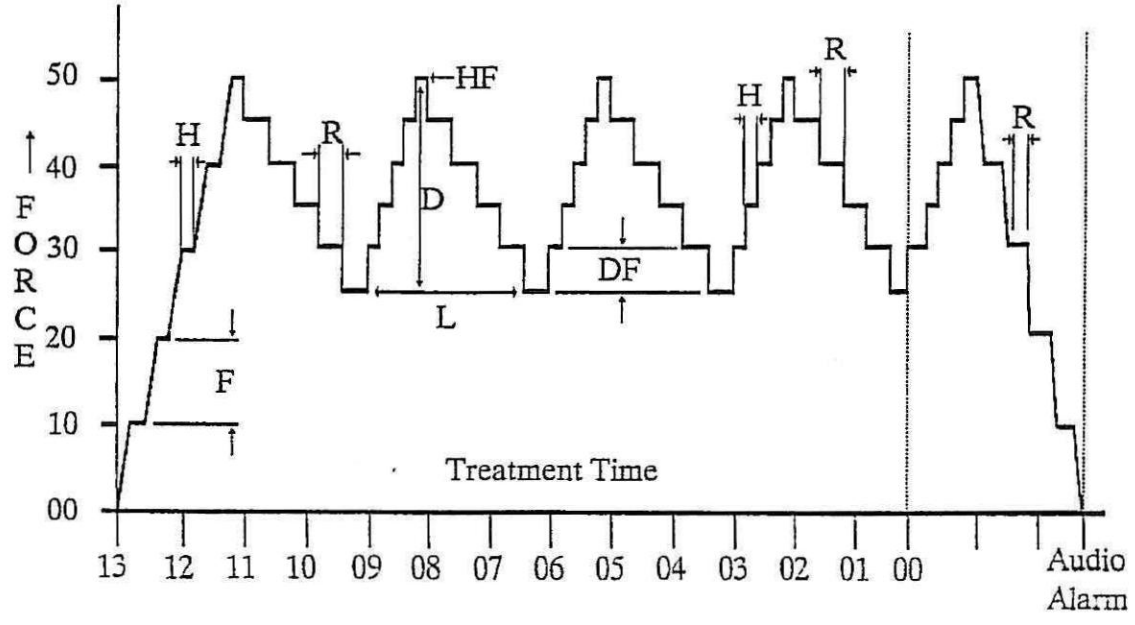
Options

Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	13 min
Hold Time	=	15 sec
Rest Time	=	20 sec
High Force	=	50
Low Force	=	25

This stepped intermittent traction is applied using two force levels. The machine pulls and releases in graduated steps for the whole duration of treatment. The size of the steps is proportionate to the maximum force and the difference between the maximum force and the low force or zero setting. A pause/delay between each step can also be pre-set for both the "hold" and "rest" periods at the upper and lower force level. At the end of treatment time the current cycle will be completed. The force is then reduced in steps to zero. The audio alarm will then sound.



Programme 5 *Progressive - Regressive Intermittent*

HF	=	High Force
L	=	Low Force
H	=	Hold Time
R	=	Rest Time
D	=	Difference High - Low Force
F	=	1/5 High Force

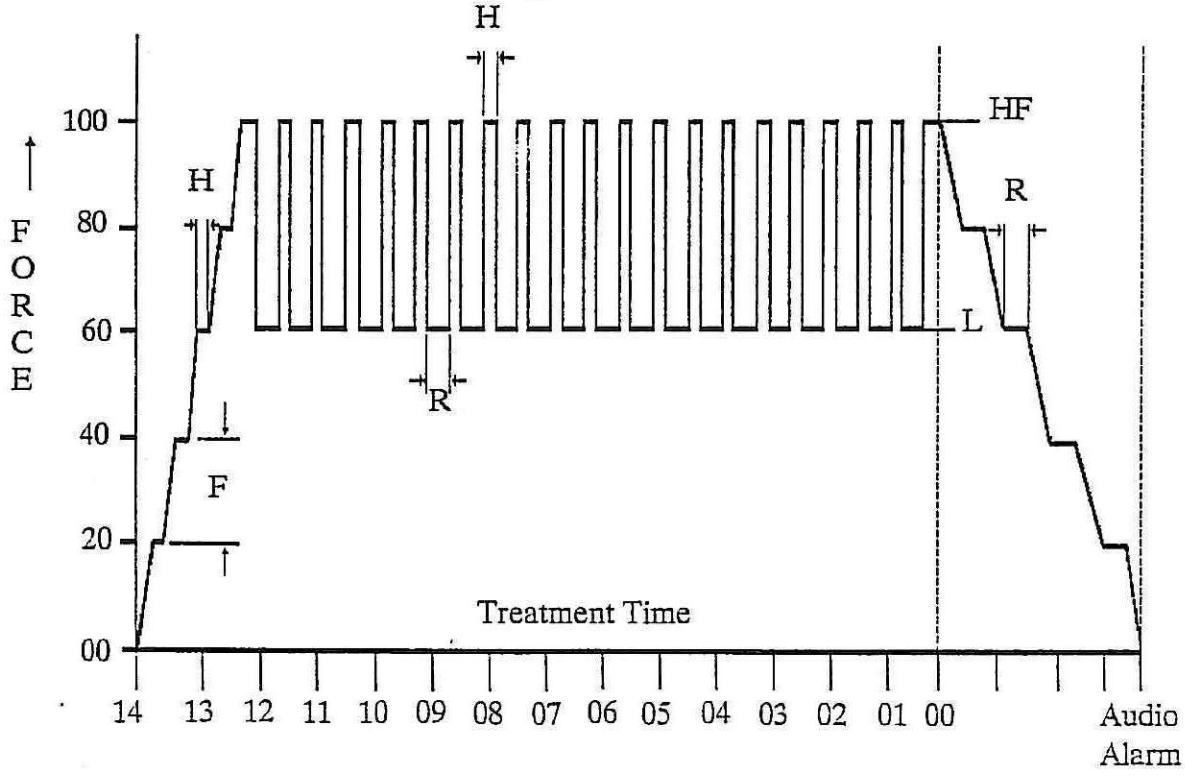
Options

Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	14 min
Hold Time	=	10 sec
Rest Time	=	20 sec
High Force	=	100
Low Force	=	60

Intermittent traction is applied using two force levels. The machine pulls to a pre-set high force and releases to a low force or zero setting. This is applied at a constant speed throughout treatment except at the start and end of the treatment cycle when the progressive/regressive facility provides a graduated pull and release in steps with a pre-set delay/pause between each step. The size of each step or pull is 1/5th of the maximum force selected and a delay/pause between each step can be pre-set using the "hold" timer at the start of treatment and the "rest" timer for the release at the end of the programme.



Programme 6 — *Cyclic - Intermittent*

HF	=	High Force
L	=	Low Force
H	=	Hold Time
R	=	Rest Time
D	=	Difference High - Low Force
F	=	1/5 High Force

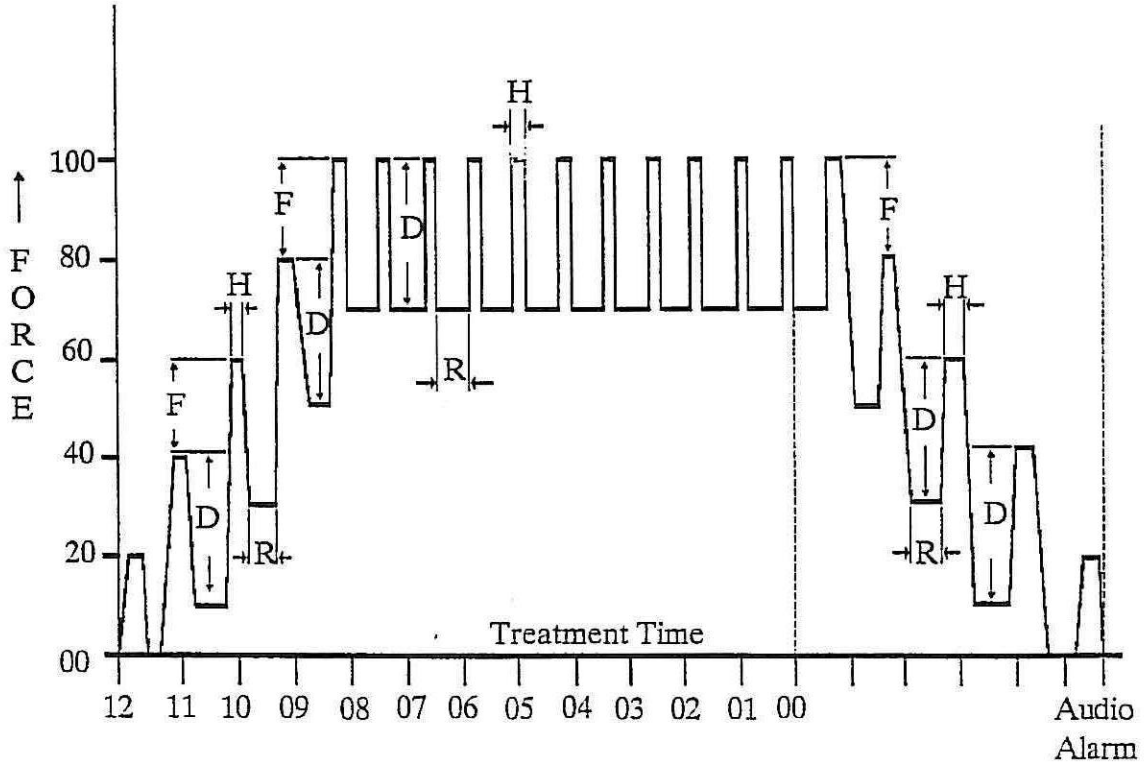
Options

Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	12 min
Hold Time	=	12 sec
Rest Time	=	30 sec
High Force	=	100
Low Force	=	70

At the start of treatment, the machine pulls and releases in five graduated intermittent steps, gradually increasing the high and low force levels with each step until the maximum high force setting has been achieved. Intermittent traction is then provided at a constant speed between the high and low force levels until the end of treatment time when the machine again steps down in five graduated intermittent steps, gradually rising and falling until the high and low force levels have both reached zero.



Programme 7

Cyclic - With Static

HF	= High Force
L	= Low Force
H	= Hold Time
R	= Rest Time
D	= Difference High - Low Force
F	= 1/5 High Force

Options

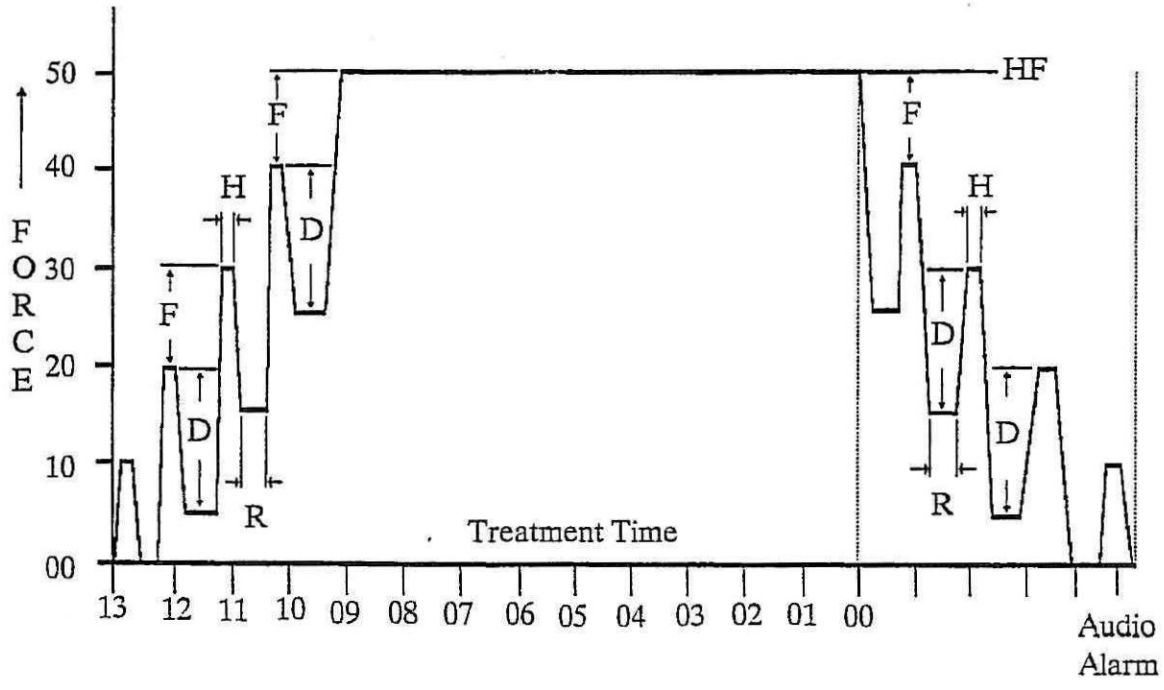
Treatment Time	0 - 99 min
Hold Time	0 - 60 sec
Rest Time	0 - 60 sec
High Force	2 - 100 kg
Low Force	0 - 98 kg

Example

Treatment Time	=	13 min
Hold Time	=	13 sec
Rest Time	=	30 sec
High Force	=	50
Low Force	=	35

At the start of treatment, the machine pulls and releases in five graduated intermittent steps, gradually increasing the high and low force levels with each step until the maximum force level has been achieved.

Sustained traction is then applied at the high force level until the end of treatment when the machine steps down in five graduated intermittent steps, gradually rising and falling until the high and low force levels have both reached zero.



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